



Food Poisoning Bacteria in Meat-Based Sandwiches

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ABSTRACT

A total of 80 random samples of fast foods represented by beef kofta, beef burger, beef shawerma, hawawshi (20 of each) were collected from different fast food restaurants in different districts at Monufia governorate, Egypt. All the collected samples were subjected to determine their quality. The obtained results indicated bacteriological examination and serotyping of Enteropathogenic *E. coli* isolated from the examined samples of ready-to-eat meat sandwiches. It is obvious that the incidence and serotyping of Enteropathogenic isolated from Salmonella the examined samples of ready-to-eat meat sandwiches *Staph. Strains* were isolated from the examined samples of ready-to-eat meat products. The obtained results in the present study indicated that meat-based sandwiches were contaminated with different types of microorganisms due to many causes mainly bad hygiene and post cooking contamination.

Keywords: Fast food, Bacteriological quality, Meat sandwiches.

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1. INTRODUCTION

Fast food is the term given to food that can be prepared and served very quickly. Typically, the term refers to food sold in a restaurant or store with low quality preparation and served to the customer in packaged form from take-out/take-away (Mostafa, 2017). Today's life styles are vastly different from those of the past. The fast pace of modern life styles and working women has led to changes in the food preparation and consumption habits. So, the demands of ready to eat meat products increased in Egyptian food market and received real consumers prefer ability because they represent quick easily prepared meat meals and solve the problem of shortage of fresh meat of high

price which isn't within the reach of large numbers of families with limited income (Murphy *et al.*, 2001 & EUFIC, 2006). Also, Ready to eat meat sandwiches are excellent concentrated nutrients sources which contain protein with high digestibility score, essential amino acids, fatty acids, vitamins and minerals which considered essential to optimal human growth and development (Vasut and Robeci, 2009). It also provides a source of readily available and nutritious meals for the consumer and is well appreciated by consumers because of their taste, low cost, nutrient value and ready availability for immediate consumption (WHO, 2002). Ready to eat meats are

especially concern since these may be consumed without further cooking and are known to be good growth substrates for pathogenic microorganisms. In addition, Lack of knowledge about food borne diseases was important risk factor of food contamination and the existence of food borne bacteria in food could induce potential health problems for consumers (Derbew *et al.*, 2013). So, the quality assurances of meat products have been the ultimate goal of all hygienists and have been of interest to a number of investigations in different geographical areas (Koutsoumanis *et al.*, 2004).

In Egypt, the most fast food sandwiches sold in street vendors and fast food restaurants are beef kofta, beef burger, hawawshi, beef shawerma, Salmonellosis is a leading cause of enteric illness, with symptoms ranging from mild gastroenteritis to systemic illness such as septicemia and other longer-term conditions. A wide range of foods has been implicated in food-borne salmonellosis. However, as the disease is primarily zoonotic, food of animal origin has been consistently implicated as the main source of human salmonellosis (FAO/WHO, 2002).

Staphylococcal food poisoning is responsible for an estimated 241,148 illness, 1064 hospitalizations and 6 deaths in the United States each year. The most common symptoms of Staphylococcal food poisoning are vomiting and diarrhea, which occurs 2 – 6hrs after ingestion of the toxin. The illness is relatively mild; usually lasting only a few hours to 1 day; however, in some instances the illness is severe enough to require hospitalization (Bennett *et al.*, 2013).

Therefore, the current study was planned out to evaluate the microbiological status of some ready to eat meat-based sandwiches sold at different districts and restaurants in Menoufia Governorate.

2. MATERIALS AND METHODS

A total of (80) random samples of ready to eat beef kofta ‘beef burger‘ beef shawerma, hawawshi are presented as (20 of each) were collected from different districts and restaurants in Shebin Elkom city Menoufia Governorate for bacteriological examination.

Bacteriological examination

1. Preparation of samples (APHA, 2001):

Fifty grams of each sample under examination were taken under aseptic condition and divided equally into two portions and each portion was put in sterile Stomacher bag. To the first one 225 ml sterile 0.1% peptone, water was added (for *E. coli* and *S. aureus* isolation), while for second portion 225ml sterile buffered peptone water was added (for *Salmonella* isolation). 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 flasks and thoroughly mixed by shaking. The prepared samples were subjected to the following bacteriological examination: Isolation and identification of Enteropathogenic *E. coli* different samples (APHA ,2001 &Quinn et al. ,2002), isolation and identification of Salmonellae organisms from different samples (ISO 6579 ,2002), determination of Staphylococci counts (ICMSF ,1996).

3. RESULTS

It is obvious that the incidence and serotyping of Enteropathogenic *E. coli* isolated from the examined samples of ready-to-eat meat products were O26:H11 EHEC (5%), O111:H2 EHEC (10%), O26:H11EPEC (5%), O128: H2 ETEC (5%) & O124 EIEC (5%) for beef burger, O55: H7 EPEC(5%), O26:H11 EHEC (5%), O111:H2 EHEC

(10%), O128 :H2ETEC(5%), O119 : H6EPEC(5%) & O158 (5%) EPEC for hawawshi, O91:H21EHEC(10%), O111:H2 EHEC (5%), O128: H2 ETEC (10%), O26:H11 EHEC (10%) & O124 EIEC(5%) for shawarma and O111:H2 EHEC (15%), O128:H2 ETEC(10%), O119:H6 EPEC(5%), O91:H21 EHEC(10%) & O86 EPEC (5%) for kofta.

It is obvious that the incidence and serotyping of Enteropathogenic isolated from Salmonella the examined samples of ready-to-eat meat products of beef burger and beef hawawshi, respectively. In regard to burger, Salmonella could be identified serologically as *S. Typhimurium*O1,4,5,12: Hi:1,2 while in beef hawawshi, *S. Enteritidis* was only

isolated O1,9,12: Hg, m. *S. Monster* O3,10,15,34: He, h.

It is indicated that the total Staphylococcal count(cfu/g) in the examined samples of ready to eat meat products ranged from 1.0×10^2 to 1.0×10^4 with an average of $4.11 \times 10^3 \pm 1.05 \times 10^3$ (cfu/g) for beef burger, 1.0×10^2 to 1.5×10^4 with an average of $2.53 \times 10^3 \pm 0.52 \times 10^3$ (cfu/g) for beef hawawshi, 9.0×10 to 4.3×10^3 with an average of $7.55 \times 10^2 \pm 1.99 \times 10^2$ (cfu/g) for beef shawarma, 7.0×10 to 1.5×10^3 with an average of $5.40 \times 10^2 \pm 1.14 \times 10^2$ (cfu/g) for beef kofta.

Table (1): Incidence and serotyping of *E. coli* isolated from the examined fast food samples. n= 20

E. coli Strains	Beef burger		Hawawshi		Shawarma	
	No.	%	No.	%	No.	%
O55: H7	1	5	1	5	1	5
O91 : H21	0	0	0	0	2	10
O111 : H2	2	10	2	10	1	5
O158	0	0	1	5	0	0
O26 : H11	1	5	1	5	2	10
O128 : H2	1	5	1	5	2	10
O119 : H6	0	0	1	5	0	0
O ₁₂₄	1	5	0	0	1	5

Table (2): Incidence and serotyping of Salmonella isolated from the examined fast food samples.

n= 20

Products Sal.strains	Products				group		
	Beef Burger	Shawerma	Hawawshi	Kofta	Antigens Structure		
					O	H	
S. Enteritidis	0	0	1	0	D ₁	1,9,12	G,m :-
S. Typhimurium	1	0	0	0	B	1,4.5.12	I: 1,2
S. Muonster	1	0	0	0	C ₁	3,10,15,34	E,h: 1,5

Table (3): Statistical analytical results of Staphylococci count (cfu/g) in the examined samples of fast food products (n=20).

Fast foods	+ve samples		Min	Max	Mean \pm S.E*
	No	%			
Beef burger	20	70	2.0×10^2	2.0×10^4	$4.11 \times 10^3 \pm 1.05 \times 10^3$
Hawawashi	20	70	1.0×10^2	1.5×10^4	$2.53 \times 10^3 \pm 0.52 \times 10^3$
Shawerma	20	70	9.0×10	4.3×10^3	$7.55 \times 10^2 \pm 1.99 \times 10^2$
Kofta	20	70	7.0×10	1.5×10^3	$5.40 \times 10^2 \pm 1.14 \times 10^2$

S.E* = standard error of mean

4. DISCUSSION

Fast food or ready to eat food are the food which are easy to make and can be eaten in an easy manner or can be taken away. The consumption and uses of fast foods have currently become a vital part of convenient food preparation patterns all over the world including Egypt. The most popular fast foods

in Egypt are Sandwich, burger, pizza, French fries and so on. The consumption of these ready-to-eat foods has been reported to be associated with serious health problems (Adams and Moss, 2000 & FDA, 2000). Changes in life-style and food habits have

been bringing about this evolving shift from traditional foods.

Incidence of *E. coli* in the examined ready-to-eat food samples: -

E. coli is used as an indicator microorganism, because it provides an estimate of fecal contamination and poor sanitation during preparation and handling, and stands as a case of public health concerns (FICCI, 2010).

So, its presence in RTE food indicates that the food has been prepared under poor hygienic conditions (Khater-Dalia *et al.*, 2013).

E. coli is readily killed by temperature above 55°C, so insufficient cooking may result in survival of *E. coli* and subsequently causes food poisoning to consumers (Belongia *et al.*, 1991). As, *E. coli* is an emergent pathogen associated with gastroenteritis (Roldan *et al.*, 2007). So, Problem of *E. coli* contamination is a common feature and is worldwide and an obvious cause of food borne diseases especially food stuffs of animal origin (Scharlach *et al.*, 2012). In general, EPEC strains are the major cause for many infantile diarrheas, in typical cases, symptoms appear within 12 to 36 hours. Clinically, EPEC illness is characterized by fever, nausea, vomiting 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, and peritonitis 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).

However, several types of Enterovirulent *E. coli* have been recognized as the etiologic agents of various gastrointestinal infections in humans. The most common strains were,

Enteropathogenic (EPEC) and Enteroinvasive (EIEC) subtypes (Kong *et al.*, 1999). Incidence and serotyping of salmonellae organism in the examined fast food samples: Salmonellosis is a great problem and one of the most important food born disease. Mishandling in preparation of food of animal origin was the major reason for the outbreak of salmonellosis (e.g. 25 of 35 registered outbreaks in 1986 were related to food of animal origin) (Rachmanin and Koulikouskii, 1990). The number of human cases of salmonellosis increased due to serious hygienic deficiency in food technology during processing, production and storage of food as well as due to poor hygiene of personal working (Koutikoyski and Kasijanenko, 1991). Salmonella organisms may be commonly carried by human and animal, when those bacteria are multiplied in the intestine they become pathogenic and causing intestinal disorder and slight or severe infection and may even cause death (Marriott, 1997). The symptoms of salmonellosis include diarrhea, nausea, vomiting, fever and abdominal cramps (Cui, 2004).

Total Staphylococcal count/g of the examined ready-to-eat food samples: Many of the 32 species and subspecies in the genus *Staphylococcus* are potentially found in foods due to environmental, human and animal contamination. *Staphylococcus aureus* is one of the most resistant non-spore-forming human pathogens and can survive for extended periods in a dry state. *Staphylococcus aureus* is a versatile human pathogen capable of causing food poisoning, toxic shock syndrome, pneumonia, postoperative wound infections and nosocomial bacteremia (Seo and Bohach, 2007). *Staphylococcus* can be carried on hands, nasal passage or throats. Most food borne illness outbreaks are result of contamination from food handlers and production of heat stable toxins in food.

Sanitary food handling and proper cooking and refrigerating should prevent Staphylococcus food borne illness (FSIS ,2003).

The symptoms of staphylococcal food poisoning are abdominal cramps, nausea, vomiting, sometimes followed by diarrhea (never diarrhea alone). The onset of symptoms remission is observed after 24h (Le Loir ,2003). The achieved results in the current study allow concluding that ready to eat meat and poultry meat products were contaminated with different types of microorganisms due to many causes mainly bad hygiene and post cooking contamination. Furthermore, the examined samples of meat sandwiches were more contaminated with the highest level of microorganisms because such products may receive more handling during preparation as well as addition of spices which act as a source of contamination. Therefore, to improve the hygienic status of ready to eat foods, the recommendations must be taken in consideration.

5. CONCLUSION

Application and implementation of Hazard Analysis and Critical Control Point (HACCP) system may be the appropriate solution to ensure quality and safety of fast food especially during preparation and serving.

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