Incidence of Coliform and Staphylococcus aureus in ready to eat fast foods

Fahim Aziz Eldin Shaltout[1]; Mohammed Farouk[2]; Hosam A.A. Ibrahim[3] and Mostafa E.M. Afifi[4]

[1]*Food Control Department, Faculty of Veterinary Med., Benha University, Egypt.*
[2]*Food Hygiene Dept., Eldoki Lab., Animal Health Research Institute*
[3] *Food Hygiene Dept., Faculty of Veterinary Med., Alexandria University and*
[4]*Veterinary Hospital Faculty of Veterinary Med., Benha University.*

A B S T R A C T

A total of 100 random samples of ready- to – eat sandwiches of beef products of 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 *Coliform* and *Staphylococcus aureus* microorganisms. The obtained results in the present study indicated that the mean value of coliform counts (cfu/g) in the examined samples of ready- to - eat meat products were 2.5 x 10^3 ± 0.74×10^3 for beef kofta, 8.85x10^2 ±1.92x 10^2 for beef shawerma, 8 x10^3 ± 1.65 x 10^3 for beef sausage, 9.0 x 10^4 ± 2.30 x 10^4 for beef liver, furthermore the coliform were detected in 60% of beef kofta, 40% of beef shawerma, 52% of beef sausage and 80% of beef liver. The obtained results in the present study indicated that the *staphylococcus aureus* was detected in 32% of beef kofta, 44% of beef liver, 8% of beef shawerma and 16% of beaf sausage .The obtained results in the present study indicated that the ready- to-eat liver sandwiches were more contaminated with *Staphylococcus aureus as* compared with those of kofta, shawerma and sausage. The examined samples of ready-to-eat liver sandwiches showed high incidence of coliform than those obtained by kofta, sausage and shawerma.

Key Words: ready- to – eat sandwiches, Coliform, Staphylococcus aureus, kofta, liver, shawerma, sausage.

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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 from takeout/take-away. Due to the variety of ready-to-eat foods, the interpretation of microbiological results obtained from testing must be accounted for the method of processing and the individual components of the food (Food Standards Australia New Zealand, 2001). Therefore, the current study was planned out 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 are presented as (25 of each) were collected from different districts and restaurants in Benha city Kaliobia Governorate to be evaluated bacteriologically. 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 bacterial quality of them and 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.

2.2.2. Determination of Coliform count (International commission of Microbiological Specification for foods (ICMSF), 1996)

The same technique of the previous surface plating method was applied using Violet Red Bile agar medium. The plates were incubated at 37°C for 24 hours. All pink colonies measuring 0.5 mm or more in diameter on uncrowded plates were then counted and the average number of colonies were determined. Multiply the number of colonies by the dilution to obtain the number of Coliform organisms per gram of sample.

2.2.3. Determination of S. aureus Count (ICMSF, 1996)

Accurately, 0.1 ml from each of previously prepared serial dilutions was spread over duplicated plates of Mannitol agar using a sterile bent glass spreader. The inoculated and control plates were incubated at 37°C for 48 hours. The developed colonies (white, orange and yellow) were enumerated and the total Staphylococci count /g was calculated. Also, the colonies were picked up and purified on Semi-solid nutrient agar slopes for further identification. Moreover, yellow colonies surrounded by a halo zone (suspected *Staph. aureus)* were picked up and kept in Semi-solid agars lopes for morphological examination and biochemical identification.

2.3. Isolation of Staph. aureus (ICMSF. 1996)

Accurately, 0.1 ml from each of previously prepared serial dilutions was spread over duplicated plates of Baired Parker agar using a sterile bent glass spreader. The inoculated and control plates were incubated at 37°C for 48 hours. Black and shiny colonies with yellow halo zone around them (suspected *S. aureus*) were picked up and purified on Semi-solid agar slopes for morphological examination and biochemical identification.

Isolation and Identification of suspected S. aureus (Quinn et al., 2002). Morphological identification: Grams staining: Smears from suspected pure colonies were stained with Gram-stain and examined microscopically. Gram-positive cocci, arranged in irregular clusters (bunches of grapes). Detection of hemolysis: A loopful from inoculated Brain Heart Infusion (BHI) broth were streaked on the surface of 5% sheep blood agar plates and incubated at 37°C for 24 hours for detection of hemolysis. Staph. aureus is positive for hemolysis.

Motility test: Inoculate the growth culture by stabbing the center of the semi-solid agar tubes and incubated at 25°C for 48 hours, Positive result: Motile organisms migrate from the stab line and diffuse into medium. Negative results: No migration from the stab line observed (Staph. aureus was non-motile). Biochemical identification: The purified isolates of S. aureus were examined by different biochemical reactions according to Quinn et al., (2002).

2.4. Statistical analysis:

The obtained results were statistically evaluated by application of analysis of variance (ANQVA) test according to Feldman et al. (2003).

3. RESULTS

3.1. Coliform count (cfu/g) of the examined ready to eat food samples

Results achieved in table (1) declared that the mean value of coliform counts (cfu/g) in the examined samples of ready- to – eat meat products were $2.5 \times 10^3 \pm 0.74 \times 10^3$ for beef kofta, $8.85 \times 10^2 \pm 1.92 \times 10^2$ for beef shawerma, $8 \times 10^3 \pm 1.65 \times 10^3$ for beef sausage, $9.0 \times 10^4 \pm 2.30 \times 10^4$ for beef liver.

Table (1): Frequency distribution of total coliform counts in the examined ready to eat foods samples (n = 25).

Count	Kofta sand.		Shawerma sand.		Sausage sand.		Liver sand.	
	No	%	No	%	No	%	No	%
0 - < 10	10	40	15	60	12	48	5	20
10 - < 10^2	3	12	5	20	2	8	1	4
10^2 - < 10^3	7	28	3	12	3	12	3	12
10^3 - < 10^4	4	16	2	8	2	8	1	4
10^4 - < 10^5	1	4	-	-	5	20	8	32
10^5 - < 10^6	-	-	-	-	1	4	7	28
Total	25	100	25	100	25	100	25	100

Table (2): Statistical analytical results of total coliform counts in the examined ready to eat food samples.

Count	Positive samples		Min.	Max.	Mean ± S.E*
	No	%			
Kofta	15	60	6.0 x 10	8 x 10^3	2.5 x 10^3±0.74 x 10^3
Shawerma	10	40	3 x 10	2.1 x 10^3	8.85 x 10^2±1.92 x 10^2
Sausage	13	52	1.5 x 10^2	2.4 x 10^4	8 x 10^3±1.65 x 10^3
Liver	20	80	2.2 x 10^2	5.1 x 10^5	9.0 x 10^4± 2.30 x 10^4

*S.E.: Standard error.

furthermore, the coliform was detected in 60% of beef kofta, 40% of beef shawerma, 52% of beef sausage and 80% of beef liver.

3.2. Staphylococcal aureus of the examined ready-to- eat food samples

As shown in table (3) indicated that the staphylococcus aureus was detected in 32% of beef kofta, 44% of beef liver, 8% of beef shawerma and 16% of beef sausage.

Table (3): Incidence of Staphylococcus aureus isolated from the examined ready to eat food samples (n = 25).

Products	Positive samples	
	No	%
Kofta	8	32
Shawerma	2	8
Sausage	4	16
Liver	11	44
Total	25	25

4. DISCUSSION

Ready-To-Eat foods of meat products are highly demanded due to their high biological value, reasonable price, agreeable taste and easily serving. But these constituents can be contaminated by many types of microorganisms due to bad hygienic measurements. Food borne pathogens may constitute health hazard to the consumers. Street vended meat have been incriminated in several out breaks of food poisoning (Mosupy et al., 1998; World Health Organization "WHO", 1984).

Processed meats are subjected to be contaminated with several types of microorganisms from different sources during the period of slaughtering, preparation, processing and cooking. These microorganisms varied according to the method of manufacture, quality of used non-meat ingredients, and contamination level during the processing chain, packaging and storage (Narasimha and Ramesh, 1988).

Results achieved in table (1) declared that the mean value of total coliform counts (cfu/g) in the examined samples of ready- to – eat meat products were 2.5 x 10^3 ± 0.74×10^3 for beef kofta, 8.85x10^2 ±1.92x 10^2 for beef shawerma, 8 x10^3 ± 1.65 x 10^3 for beef sausage, 9.0 x 10^4 ± 2.30 x 10^4 for beef liver, furthermore the coliform were detected in 60% of beef kofta, 40% of beef shawerma, 52% of beef sausage and 80% of beef liver.

The current results in table (1) agree with those recorded by El-Rayes (2008), who found that the mean value of total coliform was 2.83xl0^3± 0.74xl0^3 (cfu/g) in the examined samples of kofta sandwiches, Yassien (1992) who found that the mean value of coliform was 3.8xl0^3 (cfu/g) in the examined cooked meat samples, Adam (2009) who found that the mean value of coliform was 9.3xl0^3 ± 3.5xl0^3(cfu/g) for street vended cooked kofta samples.

While lower results were recorded by Elwi (1994) who found that the mean value of coliform was 45x10^2 & 22xl0^2 (cfu/g) hi the examined samples of cooked meat and cooked kofta respectively and Saad et al. (2011) who found that the mean value of coliform was 5.17xl0^2 ± 1.2 x l0^2 (cfu/g) in the examined samples of grilled beef kofta. However, higher findings were obtained by Rafaie and Mostafa (1990) who found that the mean value of coliform was 33,9x10^5 (cfu/g) for shawerma samples, Hussein (1996) who found that the "mean value of coliform count was 1.8x 10^5(cfu/g) for kofta sandwiches & El-Mossalami (2003) who found that the mean value of coliform count was 1.9xl0^5(cfu/g) in the examined samples of kofta. The presence of coliforms group in meat has an epidemiological interest as some of members are pathogenic, and may result in serious infections and food poisoning. Thus, the total coliforms count may be used as a board base indicating fecal contamination of meat due to inadequate processing and / or post processing recontamination of meat (International Commission and Microbiological Specification for Foods "ICMSF", 1998).

Coliforms was significant organisms in meat as indicator of fecal contamination and had ability to

grow well over wide range of temperature below 10^0C up to 46°C (Gill et al., 1996), also the presence of coliform bacteria in great numbers may be responsible for inferior quality of meat products resulting in economic losses and the possibility of presence of enteric pathogens which constitute public health hazard (Trout and Osburn, 1997).

The high incidence of coliforms in the examined ready-to-eat -sandwiches indicates inadequate processing or post processing contamination (most probably from workers, dirty instrument, machinery and other contact surfaces), or from raw ingredients before processing which drive their contamination from various sources as human contact, polluted water, soil and manure, the presence of conforms indicates a probable fecal sources of contamination (International Commission and Microbiological Specification for Foods "ICMSF", 1978; National Academy of Science (NAS), 1985; Thatcher and Clark, 1975).

Table (3) indicated that the staphylococci were detected in 32% of beef kofta, 44% of beef liver, 8% of beef shawerma and 16% of beef sausage. *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 born illness (Food Safety and Inspection service "FSIS", 2003). The presence of *Staphylococcus aureus* in a food indicates its contamination from food handlers &in adequately cleaned equipment (International commission of Microbiological Specification for foods (ICMSF), 1996). *Staphylococcus aureus* intoxication is a worldwide problem where several foods poisoning outbreak were reported due to consumption of meat products contaminated with this organism. Accordingly, *Staphylococcus aureus* can be taken as index of sanitary conditions under which meat and its products are manufactured and handled (Potter, 2001). 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 et al., 2003).

Such organisms were previously isolated from ready-to-eat meat products by Soliman et al. (2002) & Kirralla (2007) who isolate *Staphylococcus aureus* from cooked meat samples.

Staphylococcal food poisoning is the result of performed enterotoxins feat are produced by certain strains of *Staphylococcus aureus* resulting in symptoms of an intoxication, not an infection. The most common symptoms appear approximately 3-8hrs after ingestion and include nausea, vomiting, abdominal cramps and diarrhea. Generally, symptoms are short in duration (approximately 24 - 48hrs) (Sandle and Mckillip, 2004).

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