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MICROBIOLOGICAL QUALITY OF SHAWARMA IN ASSIUT

(With 2 Tables)

By

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دراسة بكتريولوجية عن الشاورمه في أسيوط

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تم فحص ٣٠ عينة من الشاورمة التي جمعت تحت الظروف الصحية المعقمه من مطاعم أسيوط المختلفة. ولقد تم عد الميكروبات الآتية: Aerobic Plate count, Coliforms, S. aureus and Enterococci counts. وجد أن عدد Aerobic plate count يتراوح بين ٦ × ١٠^٣ الى ١٥ × ١٠^٨ والمتوسط في الجرام الواحد من العينات هو ٢٤٫٦ × ١٠^٧. كما وجد أن عدد Coliforms and S.aureus يتراوح بين ١×١٠^٢ الى ٥ × ١٠^٧ و ٨ × ١٠^٢ الى ٥ × ١٠^٩ ومتوسط العدد لهما هو ٣٣٫٩ × ١٠^٦ و ٤٫٩ × ١٠^٥ بالترتيب . وقد أمكن عزل الميكروبات الآتية: Hafnia alvei,Citrobacter freundii,Klebsiella Pneumoniae and Enterobacter cloacae. وقد تم مناقشة الأهمية الصحية ومدى خطورة هذه الميكروبات على صحة المستهلك.

SUMMARY

Thirty samples of Shawarma (Cooked meat) were aseptically collected from various fast-food restaurants in Assiut City. The samples were examined for aerobic plate counts, Coliforms, S.aureus and Enterococci counts and for detection of Salmonellae and Shigellae. The aerobic plate count ranged from $6x10^3$ to $15x10^8$/g. with a mean value of $24.6x10^7$/g. The counts of coliforms and S.aureus ranged from $1x10^2$ to $5x10^7$/g. and $8x10^2$ to $5x10^5$/g. with a mean value of $33.9x10^6$ and $4.9x10^4$/g. respectively. The coliforms which could be detected in the examined Shawarma included Hafnia alvei, Citrobacter freundii, Klebsiella Pneumoniae and Enterobacter cloaca. Enterococci, Salmonella, Shigella could not be detected in the examined Shawarma samples. Enterococci counts were less than 100/g.

The present investigation indicated that food-borne pathogens present in Shawarma constitute a potential public health hazard.

INTRODUCTION

Shawarma is a popular meat sandwich of either beef or lamb. Similar products of different names in different countries are also called : yeros, dona kebabs, doner-

kebobs, durne kebabs, donah, Shawirma, gyros and Souvlaki (BRYAN, et al., 1980 and AYAZ, et al. 1985).

Preparation of Shawarma : slices of beef or lamb are mounted on a skewer, about a meter long, to form a frustum. Large parts of fat alternate with the meat. The moisture and fat content of the mass cause the particles to cohere especially during cooking. The weight of a Shawarma skewer varies from 9 kg. to 14 kg. The raw product is immersed for 8 to 12 h. in a preparation of vinegar, salt and spices for marination (BRYAN, et al. 1980 and AYAZ, et al. 1985).

The frustum-shaped mass is held vertically in an open broiler for 4 to 6 h. with the source of heat from one direction. As the meat rotates on the skewer, it is broiled continuously and slowly.

Thin slices of cooked meat are carved from the outer surface of Shawarma, and are served as a sandwich in Arabic bread or on a hot dog-like bun (Samouli), with onion, parsley, lettuce, tomato and with a special dressing of tahena, (sesame seed paste), yogurt and/or sour cream (BRYAN, et al. 1980 and AYAZ, et al. 1985).

Gyros cooked on broilers attained temperatures which were sufficient to kill vegetative bacteria on the surfaces of the meat and on the thin layer just below the surface but not in most internal regions (BRYAN, et al. 1980).

MATOSSIAN and KINGCOTT (1979) and AYAZ, et al. (1985) reported food poisoning outbreaks from dona kebab, a product similar to Shawarma. Their study suggested that contamination of Shawarma and dona kebab is possible, they also reported that under favorable conditions various pathogens may be responsible for food poisoning episodes.

This investigation was undertaken to determine the microbiological quality of Shawarma locally made in Assiut city.

MATERIAL and METHODS

Collection of samples:

Shawarma samples were collected from various fast-food restaurants in Assiut city. All samples were aseptically packaged and brought to the laboratory with a minimum of delay.

Preparation of sample:

A 25 gms portion of each sample were added to 225 ml of sterile 0.1% peptone water in a sterile blender. The sample was blended for 3 min. at high speed. Serial dilutions from 10 to 10^7 were made and then the bacteriological analyses were performed.

Bacteriological analyses:

Aerobic Plate Count:

Standard Plate count agar was used for the aerobic plate count according to A.P.H.A. (1972).

Coliforms:

0.1 ml of each dilution was plated on violet red bile agar (VRB) according to MERCURI and COX (1979). The plates were incubated at 37°C for 18-24 h. All purplish-red colonies surrounded by a red zone of precipitated bile acids were counted. Biochemical tests were done on the isolated colonies according to EDWARD and EWING (1972).

Enumeration of Enterococci:

Enterococci count was carried out according to EFTHYMIOU, et al. (1974).

Enumeration of coagulase positive Staphylococci:

0.1 ml from each of the previously prepared dilutions was transferred and evenly spread over a dry surface of Baird-Parker medium plates (THATCHER and CLARK, 1975). Inoculated plates were incubated at 37°C for 48 h. Suspected colonies were counted (black and shiny colonies, greater than 1 mm in diameter showing clear hallow zone of opacity around or beneath the clonies).

Coagulase test was carried out according to CRUICKSHANK, et al. (1975).

Detection of Salmonella & Shigella organisms:

10 gm portion of each sample were inoculated into 200 ml selenite cystine broth and incubated at 37°C for 18-24 h. After incubation a loopfull was streaked on SS agar (Difco). Suspected Salmonella or Shigella colonies were further identified biochemically and serologically according to (CRUICKSHANK, et al. 1980).

RESULTS

Obtained results were recorded in tables (1) and (2).

DISCUSSION

Aerobic plate count:

The distribution of aerobic plate count of Shawarma is shown in table (1). The aerobic plate count ranged from $6x10^3$ to $15x10^8$/g. with a mean value of $24.6x10^7$/g. These findings agree with that reported by HALL, et al. (1967), FRUIN, et al. (1978)

and AYAZ, et al. (1985) while lower findings were reported by PACE (1975), OBLINGER and KENNEDY (1980), OCKERMAN and STEC (1980) and TIWARI and KADIS (1981).

BRYAN, et al. (1980) reported that temperatures attained during cooking would be able to kill any vegetative pathogenic food-borne bacteria, but bacterial spores that survived cooking, and any bacteria that contaminated the meat as a result of carving or subsequent handling could have multiplied after cooking.

Coliforms:

The number of coliforms in Shawarma ranged from $1x10^2$ to $5x10^7$/g. with a mean value of $33.9x10^5$/g. The total coliform counts found in Shawarma showed a close agreement with that reported by AYAZ, et al. (1985). Higher findings were reported by CHRISTIANSEN and KING (1971) and OCKERMAN and STEC (1980).

FACE (1975) stated that aerobic plate count exceeding 10^6/g. or coliforms higher than 10^2 cells/g. is an index of high numbers of bacteria in food. Prevalence and levels of coliforms in this study were relatively high indicating the unsanitary practices during manufacture and handling of the product.

Types of coliform organisms isolated from examined Shawarma samples were Hafnia alvei, Citrobacter freundii, Klebsiella Pneumoniae and Enterobacter cloacae. E.coli could not be detected in the examined Shawarma samples and these findings agree with that reported by HALL, et al. (1967) and TIWARIA and KADIS (1981).

Staphylococcus aureus:

Coagulase-positive S.aureus counts ranged from $8x10^2$ to $5x10^5$/g. with a mean value of $4.9x10^4$/g. Similar findings were found by AYAZ, et al. (1985).

S.aureus was detected in 19(63.3%) of the examined Shawarma samples.

PRYAN, et al. (1980) recorded that temperatures that would be lethal for vegetative pathogenic food-borne bacteria could not destroy Staphyloenterotoxin.

Enterococci:

Enterococci count could not be detected on the plates ($\nearrow 10^2$). The recorded results showed that the product were not subjected to bacterial contamination especially those of feacal sources.

Moreover, Salmonella, Shigella could not be detected in the examined samples of Shawarma and this could be attributed to the fact that the total flora is much more heat resistant than Salmonellae (PALUMBO, et al. 1974).

The presence of food-borne pathogens in already cooked Shawarma could be attributed to the contamination from knives during carving of meat or dripping from the interior of uncooked portion and/or post-contamination (AYAZ, et al. 1985).

MICROBIOLOGICAL QUALITY OF SHAWARMA

Microbial contaminatin of Shawarma would occur during handling and slicing in addition to any initial post-processing handling (OBLINGER and KENNEDY, 1980).

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Table (1)
Aerobic plate count, coliforms, S.aureus, and Enterococci counts in Shawarma

	Minimum	Maximum	Mean
Aerobic plate count	6×10^{3}	15×10^{8}	24.6×10^{7}
Coliforms count	1×10^{2}	5×10^{7}	33.9×10^{5}
S.aureus count	8×10^{2}	5×10^{5}	4.9×10^{4}
Enterococci count	$7\ 10^{2}$	$7\ 10^{2}$	$7\ 10^{2}$

Table (2)
Types of Coliform organisms detected in Shawarma

No. of samples examined	Positive samples		No. of strains isolated	Types of Coliform organisms							
				Hafnia alvei		Citrobacter freundii		Klebsiella pneumoniae		Enterobacter cloacae	
	No.	%		No.	%	No.	%	No.	%	No.	%
30	30	100	150	48	32	46	30.7	39	26	17	11.3