Microbiological Quality of Shawerma at Fast Food Restaurants

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Abstract

This study was performed to evaluate the microbiological quality of Shawerma at fast food restaurants in Suez governorate. A total of 60 samples, about 100 g each were collected randomly and examined for microbiological indices. The mean values of total aerobic, total anaerobic, total aerobic spore forming, total thermophilic colony counts, Escherichia coli, Staphylococcus aureus, coliforms, Enterobacteriacae and Bacillus cereus were 4.26± 0.09, 2.56± 0.10, 1.25± 0.19, 2.30± 0.05, 0.67± 0.12, 0.82± 0.14, 0.85± 0.16, 1.06± 0.20 and 1.06± 0.13 (log10 CFU/ g) respectively. While Clostridium perfringens, faecal coliforms, yeast and mould counts were <1(log10 CFU/ g), moreover Salmonella spp. were not detected in all samples.

From the microbiological quality point of view in comparison with Gilbert et al, 2000 (category No. 2), 18 (30%) of the total examined samples were unsatisfactory, 19(32%) were acceptable and 23(38%) were satisfactory. The unsatisfactory samples were due to E-coli (11)18% of count ≥2 (log10 CFU/ g) and Staph. aureus (12)20% count of 2-< 4 (log10 CFU/ g).

Introduction

Shawerma is considered as one of the most important and delicious meat products served at fast food restaurant chains. Egyptian ate 46% of meals away from home in 1998, which is considerably more than in 1981 (20%) (*Galal, 2002*). The influence of restaurant location, type of sandwich, time of day, and initial contamination were consider as important factors for determine the microbiological indices of shawermaThe name shawerma comes from the Turkey word meaning turning, and has its origins in Anatolia. The classic shawerma is a combination of pita bread, tomato, cucumber and the shaved meat. The heat treatment of processed meat products help in enhancement of desirable texture, flavour and colour, reduction of microbial content *(Heinz and Haut zinger 2010)*. The microbial quality of a certain food is the result of a chain of events that the microbial safety of food can only be guaranteed when the overall processing, including the production of raw materials, distribution and handling by the consumer are taken into consideration *(Hofstra et al. 1994)*.

Microbiological quality problems in shawerma largely depend on low quality of raw meat and/or other ingredients, inefficient cooking process, improper sanitary practices for personnel, and cooking processing utensils *(Vazgecer et al. 2004, ICMSF 1988).* One or more of these factors may lead to potential health hazards for consumers *(Harakeh et al. 2005). Evans, et. al. (1999)* reported that during July 1995 an outbreak of Salmonella in South Wales was linked to the consumption of döner kebabs, the investigations pointed to cross-contaminated relishes and dressings as well as undercooked meat as potential vehicles. While *Richardson and Stevens (2003)* mentioned that there were significant associations between bacteriological quality and temperature of storage. There was a lack of information about the incidence of foodborne diseases related to Shawerma in addition to the absence of microbiological standards for this food product *(Nemati et al. 2008).* This study aimed to evaluate the microbiological quality of shawerma from fast food restaurants inSuez governorate.

Material and methods

A total of 60 Shawerma meat slices samples about 100 g of each were collected from different fast food *restaurant* services with different sanitary levels at Suez governorate. The samples were analyzed microbiologically as recommended by International Organization for Standardization; *ISO (2002a)* for total aerobic colony counts, American Public Health Association; *APHA (2002)* for anaerobic colony counts, total aerobic spore forming counts and total thermophilic counts, Nordic Committee On Food Analysis; *NMKL- modified (1996)* for *E. coli* count, *ISO (2004b)* for *Clostridium perfringens* count, *ISO (1999a)* for *Staphylococcus aureus* count , *ISO (2005)* for Coliforms count , *NMKL (1996)* for Faecal coliforms count , *ISO (2004c)* for Enterobacteriacae count, *ISO (2004a)* for *Bacillus cereus* count, *(ISO 2008)* for Yeast and Mould counts and *ISO (2002b)* for Salmonella spp. detection. Shawerma can be microbiologically assessed using Public Health Laboratory Service, PHLS microbiological guidance recommended by *Gilbert, et. al. (2000).*

Bacterial Indices log count	Satisfactory	Acceptable	Unsatisfactory
Total aerobic colony counts	<4	4 - <5	≥5
E-coli	<1.3	1.3 - <2	≥2
Clostrium perfringens	<1.3	1.3 - <2	2 - <4
Staphylococcus aureus	<1.3	1.3 - <2	2 - <4
Enterobacteriaceae	<2	2 - <4	≥4
Bacillus cereus	<3	3 - <4	4 - <5
Salmonella spp /25g	not detect/25 g		Detected/25 g

Results and discussion:

The data shown in table (1) revealed that the mean± S.E values of total aerobic colony counts, total anaerobic colony counts, total aerobic spore forming counts, total thermophilic counts, scherichia coli, Staphylococcus aureus, coliforms, Enterobacteriacae and Bacillus cereus were 4.26± 0.09, 2.56± 0.10, 1.25± 0.19, 2.30± 0.05, 0.67± 0.12, 0.82± 0.14, 0.85± 0.16, 1.06± 0.20 and 1.06± 0.13 (log_{10} CFU/ g) respectively.

The data achieved in table (2) illustrated that the frequency distribution of total aerobic colony counts, total anaerobic colony counts, total aerobic spore forming counts, total thermophilic counts, Escherichia coli, Staphylococ-cus aureus, coliforms, Entero-bacteriacae and Bacillus cereus were 3->6, 1- <6, 1-<4, 1-<4, 1-<3, 1-<4, 1-<4, 1-<4 and1-<3 (log_{10} CFU/g) respectively, while all of Clostridium perfringens, faecal coliforms, yeast and mould were <1(log_{10} CFU/ g), moreover Salmonella spp. were not detected in all of the examined Shawerma samples.

Table (3) presented that in comparison with the *PHLS (2000)* category No. 2, the unsatisfactory samples were due to E-coli (11)18% of count ≥2 (log_{10} CFU/ g) and Staph. aureus (12)20% count of 2-< 4 (log_{10} CFU/ g). The obtained result seems to be higher than that reported by *Gormely et al. (2010)*. B. cereus results come satisfactory to all the samples 60(100%) count of <3 (log_{10} CFU/ g). Clostridium perfringens, faecal coliforms, yeast and mould were <1(log_{10} CFU/ g), Salmonella spp. were not detected in any of the samples.

The presented data demonstrated in table (4) revealed that 18 (30%) of the total exami-ned samples were unsatisfact-ory, 19 (32%) were acceptable and 23 (38%) were satisfact-ory. The non-satisfactory res-ults of this study seems to be higher than that reported by *Burgess and Little (2004) and Nichols, G. et al. (2004)*. On the other

hand, the acceptable result seems to be lower than that reported by *New South Wales Food Authority, NSW (2008).* These variations in the results were attributed to the quality of raw materials which incl-ude meat and meat additives and the hygiene state adopted during processing and prepar-ation of the product

Recommendations:

To improve the quality of Shawerma and to safeguard the consumer health the foll-owing recommendations must be considered:

1. Application of good hygienic practice with a selection of high quality raw meat and meat additives.
2. Cooking shawerma thoroughhhly.
3. The leftover shawerma must be treated correctly and the leftover slices must not allowed to be used in the next day, the leftover block must be stored at -18° C and reheated at +75° C.
4. The governmental authority must be issued a standard for a microbiological guideline for the Egyptian Shawerma.

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Table (1):- Statistical Analytical results of maximum, minimum and mean (log_{10} CFU/ g) values in the examined shawerma samples

Microbiological counts	No.	Min.	Max.	mean	S.E.
Total aerobic colony counts	60	3	6.04	4.26	0.09
Total anaerobic colony counts	60	1.30	5.48	2.56	0.10
Total spore forming counts	60	<1	5.40	1.25	0.19
Total thermophilic counts	60	1.60	3.26	2.30	0.05
E-coli counts	60	<1	2.26	0.67	0.12
Clostrium perfringens counts	60	<1	0.00	0.00	0.00
Staphylococcus aureus counts	60	<1	3.00	0.82	0.14
Coliforms count	60	<1	3.85	0.85	0.16
Faecal coliforms count	60	<1	0.00	0.00	0.00
Enterobacteriaceae counts	60	<1	4.95	1.06	0.20
Bacillus cerues counts	60.	<1	2.48	1.06	0.13
Yeast counts	60	<1	0.00	0.00	0.00
Mould counts	60	<1	0.00	0.00	0.00

No. is the number of samples
Min. is the minimum values
Max. is the maximum values
S.E. is the stander errors

Table (2) Statistical analytical results of the frequency distribution (log_{10} CFU/ g) of the microbiological counts of shawerma (n = 60)

Microbiological counts	<1	1-<2	2-<3	3-<4	4-<5	5-<6	>6
Total aerobic colony counts	0	0	0	24	24	11	1
Total anaerobic colony counts	0	15	30	12	2	1	0
Total spore forming counts	33	0	21	5	0	1	0
Total thermophilic counts	0	16	39	5	0	0	0
E-coli counts	40	9	11	0	0	0	0
Clostrium perfringens counts	60	0	0	0	0	0	0
Staphylococcus aureus counts	37	11	11	1	0	0	0
Coliforms count	40	4	11	5	0	0	0
Faecal coliforms count	60	0	0	0	0	0	0
Enterobacteriacae counts	40	4	11	5	0	0	0
Bacillus cerues counts	29	15	16	0	0	0	0
Yeast counts	60	0	0	0	0	0	0
Mould counts	60	0	0	0	0	0	0
	Detected			Not detected			
Salmonella spp /25g	0			60			

Table (3) Microbiological quality of shawerma using microbiological guidelines Gilbert, *et. al.* (2000) category No. 2 (n=60).

Satisfactory		Acceptable		Unsatisfactory	
No.	%	No.	%	No.	%
23	38	19	32	18	30

Table (4) Microbiological criteria of shawerma in comparison with Gilbert, *et. al.* (2000) category No. 2 category 2 (n=60).

Bacterial Indices	Satisfactory	Acceptable	Unsatisfactory
Total aerobic colony counts	24 (40%)	24 (40%)	12 (20%)
E-coli	40 (66.7%)	9 (15%)	11 (18.3%)
Clostridium perfringens	60 (100%)	0 (0%)	0 (0%)
Staphylococcus aureus	37 (61.7%)	11 (18.3%)	12 (20%)
Enterobacteriacae	44 (73.3%)	16 (26.7%)	0 (0%)
Bacillus cereus	60 (100%)	0 (0%)	0 (0%)
Salmonella spp /25g	60 (100%)		0 (0%)

الملخص العربي

الجودة الميكروبيولوجية للشاورما في مطاعم الوجبات السريعة

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اجريت هذه الدراسة للوقوف علي جودة وسلامة لحوم الشاورما المتداولة في مطاعم الوجبات السريعة بمحافظة السويس من الناحية الميكروبيولوجية, وقد تم تجميع عدد ٦٠ عينة عشوائيا" وتم فحصها ميكوبيولوجيا". وقد أظهرت الدراسة أن القِيَمَ المتوسطةُ لكل من الجراثيم الهوائية, و اللاهوائية, و المتجرثمة الهوائية, والمحبة للحرارة, ميكروب الإيشيريشيا كولاي, وجراثيم المكور العنقودي الذهبي, وجراثيم شبه العصية القولونية, المجموعة القولونية و جراثيم العصويات المتجرثمة في عيناتِ الشاورما المَفْحُوصة هي ٤,٢٦ ±٠,٠٩, ٢,٥٦ ±٠,١٠, ١,٢٥ ±٠,١٩, ٢,٣٠ ±٠,٠٥, ٠,٦٧ ±٠,١٢, ٠,٨٢ ±٠,١٤, ٠,٨٥ ±٠,١٦, ١,٠٦ ± ٠,٢٠و ١,٠٦ ±٠,١٣ لوغاريتم ١٠جرثومة لكل جرام على التوالي. و لم يتم عزل جراثيم شبه العصية القولونية البرازية , الكوليستريديم برفرنجينس , الفطر , الخمائر وميكروب السالمونيلا من كل من العينات المختبرة. وبالتحليل الإحصائي للنتائج بالمقارنة مع الدليل الميكروبيولوجي كانت ١٨عينة (٣٠٪) من العينات مقبولة ميكروبيولوجيا", ١٩ عينة (٣٢٪) مرضية بينما كانت ٢٣ عينة (٣٨٪) غير مقبولة ميكوبيولوجيا" وذلك نتيجة وجود ميكروبات الايشيريشيا كولاي بنسبة ١٨ ٪ والمكور العنقودي الذهبي بنسبة ٢٠% عن الحدود المقررة بالدليل.