

THE ROLE OF FAST FOOD IN TRANSMITTING SOME BACTERIAL HAZARDS TO CONSUMERS

LUBNA MOHAMMED IBRAHIM and AZHAR MOHAMMED HASSAN

Animal Health Research Institute (Assiut Lab.)

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ABSTRACT

Thirty samples of ready to eat Kofta, beef burger and sausage sandwiches (10 from each) were collected from street vendors and another thirty samples of the same products (10 from each) were collected from different restaurants all were sourced from different areas in Assiut City and analyzed bacteriologically to assess the safety of these sandwiches. The results revealed that the mean values in the examined samples of street vended Kofta, beef burger and sausage sandwiches were 42.3×10^4 , 96.4×10^4 and 28.22×10^5 cfu/g for APC respectively, and they were 26.7×10^5 , 97.3×10^3 and 64.42×10^4 cfu/g in the examined samples of Kofta, beef burger and sausage sandwiches collected from restaurants respectively. Based on the microbiological guidelines for ready-to-eat food by center for food safety, 80% and 50% of street vended and restaurant kofta sandwiches were satisfactory according to their APC, also the street vended and restaurant burger sandwiches had the same results. Meanwhile, 20% and 80% of street vended and restaurant sausage sandwiches were satisfactory according to their APC. Results of *Enterococcus* count declared that the mean values were 11.9×10^5 , 15.61×10^4 and 22.68×10^4 cfu/g in the examined samples of street vended Kofta, beef burger and sausage sandwiches respectively, and they were respectively 63.3×10^4 , 34.03×10^4 and 28.63×10^4 in the examined samples of Kofta, beef burger and sausage sandwiches collected from restaurants. Some strains of *Enterococcus* spp. were isolated with different percentages, and identified as *Ent. columbae*, *Ent. Cecroum*, *Ent. mundtii*, *Ent. Hirea* and *Ent. Facium*. *Staph. aureus* could be isolated with an incidence of 10%, 40% and 60% from the examined sample of Kofta, beef burger and sausage street vended sandwiches respectively, and it was isolated with an incidence of 10% from kofta sandwiches collected from restaurants, while could not be isolated from beef burger and sausage sandwiches collected from restaurants. Based on the microbiological guideline for ready-to-eat food by center for food safety, all examined Kofta sandwiches, street vended sausage sandwiches and 80% of street vended burger sandwiches fell in the category satisfactory based on their limits of total *staph. aureus* count (< 20 cfu/g). Also *E. coli* could be isolated with different percentages, the isolated serotypes were O₅₅: H₇, O₂₆: H₂, O₂₆: H₁₁ and O₁₂₇: H₄.

Key works: Fast food, Kofta, beef burger, Sausage, *Staph. aureus*, *E. coli*, APC.

INTRODUCTION

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. According to the Food and Agriculture Organization, 2.5 billion people worldwide eat fast food every day (FAO, 2007).

There are many reasons why people eat away from home, these include absence from home whiles travelling, studying, whiles at work or need for a change both in terms of food type and the location, as a result many people purchase food from the streets. Such foods can transmit a wide range of diseases in a condition termed food infection, where the food

serves as a vehicle for the transfer of the pathogen to the consumer, (Murray, 2003). The occurrence of

pathogenic microorganisms has always been attributed to several factors, which include contamination through water, soil, food processing equipments, food contact surfaces and most importantly food handlers (Kawo and Abdulmumin, 2009). The transmission of human diseases through food is a global problem, particularly in developing countries where gastrointestinal diseases are one of the most important causes of morbidity and mortality. However, food habits adopted by populations may mitigate or increase the hazards.

With the increasing pace of globalization and tourism, the safety of fast food has become one of the major concerns of public health, and a focus for governments and scientists to raise public awareness of food (FAO, 2007).

Corresponding author: Dr. LUBNA MOHAMMED IBRAHIM
E-mail address: ghada02468@yahoo.com
Present address: Animal Health Research Institute (Assiut Lab.)

As the effect of microorganisms on human health has been reported, the present study was performed to give information of distribution and presence of some pathogenic microorganisms in some fast foods from street vendors and different restaurants in Assiut City, that induces food poisoning and its impact on the consumer health.

MATERIALS AND METHODS

Samples collection:

Thirty samples of ready to eat Kofta, beef burger and sausage sandwiches (10 from each) were collected from street vendors and another thirty samples of the same products (10 from each) were collected from different restaurants, all were sourced from different areas in Assiut City. The samples were collected in sterile plastic bags in ice-box, according to (Chessbrough, 1984).

Sample preparation:

The samples were prepared according to the technique recommended by APHA, (2001)

Microbiological analysis:

- Determination of Aerobic plate count according to APHA, (2001).

- Enumeration of *Enterococci* according to Deible and Hartman, (1982).
- Enumeration of *staph.aureus* count according to FDA, (2001).

Isolation and identification of pathogenic bacteria:

- *staph.aureus* were isolated and identified according to ICMSF, (1996).
- *E.coli* were isolated and identified according to APHA, (1992), isolated strains were identified serologically according to Kok *et al.* (1996), by using rapid diagnostic *E.coli* antisera sets (Denka Seiken Co., Japan) for diagnosis of the enteropathogenic types.
- Isolation and identification of *Salmonella* spp. According to HPA, (2007).
- Members belonging to *Enterobacteriaceae* were isolated and identified according to Cowan and Steel, (1974).
- *Enterocci* were isolated and identified according to Morrison *et al.* (1997).

Statistical analysis:

Was performed according to S.P.S.S (2007)

Acceptability of the examined samples for APC and *Staph.aureus* count

were detected according to microbiological guidelines CFS, (2014).

RESULTS

Table 1: Statistical analytical results of APC (cfu/g) of examined Kofta, beef burger and sausage sandwiches samples (n=60).

Examined sandwich	Source	No	Range of bacterial count (cfu/g)	Mean* (cfu/g)	Standard error
Kofta (S)	Street vendors	10	< 30- 2x10 ⁵	42.3x10 ⁴	26.3x10 ³
Kofta (S)	Restaurants	10	1x10 ³ -2x10 ⁶	26.7x10 ⁵	96.3x10 ³
Beef burger(S)	Street vendors	10	1x10 ² -4x10 ⁵	96.4x10 ⁴	46.6x10 ³
Beef burger(S)	Restaurants	10	7x10 ² -3x10 ⁵	97.3x10 ³	33x10 ³
Sausage (S)	Street vendors	10	2x10 ³ -8x10 ⁵	28.22x10 ⁵	10.3x10 ³
Sausage (S)	Restaurants	10	6x10 ¹ -5x10 ⁵	64.42x10 ⁴	49.3x10 ³

* No Significant difference (P > 0.05)

Table 2: Prevalence of accepted restaurants and street vended samples according to the microbiological guidelines (CFS, 2014) for APC

Examined sandwich	Source	Satisfactory	Borderline
Kofta (S)	Street vendors	8 (80%)	2 (20%)
Kofta (S)	Restaurants	5 (50%)	5 (50%)
Beef burger (S)	Street vendors	8 (80%)	2 (20%)
Beef burger (S)	Restaurants	5 (50%)	5 (50%)
Sausage (S)	Street vendors	2 (20%)	8 (80%)
Sausage (S)	Restaurants	8 (80%)	2 (20%)

Table 3: Statistical analytical results of *Enterococci* counts of the examined Kofta, beef burger and sausage sandwiches samples (n=60)

Examined sandwich	Source	No	Range of Enterococci counts (cfu/g)	Mean* (cfu/g)	Standard error
Kofta (S)	Street vendors	10	$3 \times 10^2 - 7 \times 10^5$	11.9×10^5	29.9×10^3
Kofta (S)	Restaurants	10	$< 30 - 5 \times 10^6$	63.3×10^4	48.8×10^3
Beef burger (S)	Street vendors	10	$8 \times 10^1 - 1 \times 10^6$	15.61×10^4	10.7×10^3
Beef burger (S)	Restaurants	10	$1 \times 10^2 - 9 \times 10^4$	34.03×10^4	11.2×10^3
Sausage (S)	Street vendors	10	$6 \times 10^3 - 5 \times 10^4$	22.68×10^4	17.6×10^3
Sausage (S)	Restaurants	10	$1 \times 10^2 - 2 \times 10^5$	28.63×10^4	23.6×10^3

*No Significant difference ($P > 0.05$)**Table 4:** Prevalence of *Enterococcus* spp. strains isolated from examined samples

Isolated strains	Kofta sandwiches				Burger sandwiches				Sausage sandwiches			
	s.v		R		s.v		R		s.v		R	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<i>Ent. columbae</i>	5	50	4	40	9	90	8	80	7	70	6	60
<i>Ent. cecorum</i>	1	10	0	0	0	0	0	0	0	0	1	10
<i>Ent. mundtii</i>	2	20	4	40	0	0	0	0	2	20	0	0
<i>Ent. Hirae</i>	0	0	3	30	0	0	0	0	1	10	0	0
<i>Ent. Facium</i>	0	0	0	0	0	0	0	0	0	0	1	10

Table 5: Prevalence of *Staph.aureus* isolated from examined Kofta, beef burger and sausage sandwiches samples*.

Kofta sandwiches		Burger sandwiches				Sausage sandwiches					
s.v		R		s.v		R		s.v		R	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	10	1	10	4	40	0	0	6	60	0	0

*Highly significant difference ($P < 0.01$)**Table 6:** Frequency distribution of *Staph.aureus* in street vended burger sandwiches.

Frequency (cfu/g)	Number	%
< 10	6	60%
13	2	20%
30	2	20%

Table 7: Prevalence and serotyping of *E.coli* isolated from examined Kofta, beef burger and sausage sandwiches samples.

Identified strains	Kofta sandwiches				Burger sandwiches				Sausage sandwiches			
	s.v		R		s.v		R		s.v		R	
	No	%	No	%	No	%	No	%	No	%	No	%
<i>E.coli</i> O55 : H7	-	0	-	0	-	0	-	0	1	10	-	0
<i>E.coli</i> O111 : H2	-	0	-	0	-	0	-	0	-	0	1	10
<i>E.coli</i> O26: H11	-	0	-	0	1	10	-	0	1	10	-	0
<i>E.coli</i> O127 : H4	-	0	1	10	-	0	-	0	-	0	-	0

Table 8: Recovery rate of Enteric bacteria isolated from examined samples.

Identified strains	Kofta sandwiches				Burger sandwiches				Sausage sandwiches			
	Street vendors		Restaurants		Street vendors		Restaurants		Street vendors		Restaurants	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<i>Proteus mirabilis</i>	-	0	-	0	3	30	-	0	-	0	-	0
<i>Klebsiella pneumoniae</i>	-	0	1	10	-	0	-	0	2	20	-	0
<i>Enterobacter aerogenes</i>	-	0	1	10	-	0	-	0	-	0	-	0

DISCUSSION

The chief purpose of microbiological examination sandwich are to give assurance that the sandwiches will be acceptable from the public health stand point and that the sandwiches will be of satisfactory quality. Roberts, (1990) reported that the three main routes by which microorganisms enter food are the foodstuff, food handlers and the environments, Whereas aerobic plate count indicates the level of microorganisms in a product and provides general estimate of live aerobic bacteria, indicating the quality, shelf life and post heat processing contamination Maturin and Peeler, (1998). It is evident from the results recorded in Table (1) that the mean values in the examined samples of street vended Kofta, beef burger and sausage sandwiches were 42.3×10^4 , 96.4×10^4 and 28.22×10^5 cfu/g for APC respectively, and they were 26.7×10^5 , 97.3×10^3 and 64.42×10^4 cfu/g in the examined samples of Kofta, beef burger and sausage sandwiches collected from restaurants respectively.

Although no significant differences in aerobic plate counts were found between the street vended and restaurants examined samples ($P > 0.05$) the street vended samples of both beef burger and sausage sandwiches still had higher total viable bacterial count than those obtained from restaurants, while street vended samples of kofta sandwiches had lower viable bacterial count than those obtained from restaurants.

Exposure of the food to air or dust at the point of sale is likely to increase the counts of the bacteria as virtually most of the bacteria are carried in aerosols by dust and air Food and Drug Administration, (2009).

The variation in bacterial counts between different types of meat products could be attributed to difference of ingredients and steps involved in their formulation and preparation Hefnawy and yousef, (1984).

The obtained results were lower than those obtained by Ibrahim-Ghada, (2001) who found that, the mean values of APC in Kofta and beef burger sandwiches collected from different restaurants were 15.3×10^6 and 29.27×10^7 cfu/g respectively, while (Ibrahim-hemmat *et al.*, 2014) recorded that the mean value of APC in kofta collected from different restaurants was 1.83×10^4 cfu/g, it was lower than that obtained in our results, also he recorded 8.61×10^4 cfu/g as a mean value of APC in sausage which was relatively agree with our results. However higher findings were obtained by (Fahim *et al.*, 2015) who found that the mean values of APC were 8.51×10^5 , 3.97×10^5 and 1.33×10^6 cfu/g in examined samples of street vended kofta, beef burger and sausage sandwiches respectively.

Based on the microbiological guidelines for ready to eat foods (CFS, 2014), the obtained results in Table (2) showed that 80% and 50% of street vended and restaurant kofta sandwiches were satisfactory, 20% and 50% were borderline quality according to their APC. Also the street vended and restaurant burger sandwiches had the same results. Meanwhile, 20% and 80% of street vended and restaurant sausage sandwiches were satisfactory, 80% and 20% were borderline quality according to their APC.

Borderline results were due mainly to high APC, Khater-Dalia *et al.* (2013), reported that 40% and 60% of street vended and restaurant kofta sandwiches were of unsatisfactory microbiological quality, also he reported that unsatisfactory results were due mainly to high APC which may indicate that the cooking process was inadequate, or post cooking contamination had occurred, or the length of time and temperature control in storage or display facilities was inadequate to prevent bacterial growth, or that a combination of these factors was involved, while Fahim *et al.* (2015) reported that out of 80 examined samples of street vended meat products 6.25% were of unsatisfactory quality due to their APC.

Results in Table (3) declared that the mean values of *Enterococci count* were 11.9×10^5 , 15.61×10^4 and

22.68 x 10⁴ cfu/g in the examined samples of street vended Kofta, beef burger and sausage sandwiches, respectively and they were 63.3x10⁴, 34.03 x 10⁴ and 28.63 x 10⁴ in the examined samples of kofta, beef burger and sausage sandwiches collected from restaurants, respectively.

Statistical analysis was performed using S.P.S.S (2007) it revealed that no significant differences in *Enterococcus* count were found between the street vended and restaurants examined samples (P > 0.05), but the street vended samples of kofta sandwiches still had higher *Enterococcus* count than those obtained from restaurants.

Although there is a scarcity in the literature concerning prevalence and distribution of *Enterococci* in the products under examination, (Stiles and Holzapfel, 1997) reported that the ability of *Enterococci* to survive in the environment, their pronounced heat resistance and their dominance of the microbial population of heat-treated foods, implies that *Enterococci* can be used as indicators for fecal contamination. Moreover, Giraffa (2002) and Foulquie *et al.* (2006) concluded that Certain features, such as the ability to growth over a wide range of temperature, salinity and pH make these organisms able to multiply in several foods and even spoil them.

Table (4) showed the incidence of the isolated *Enterococcus* spp, where *Ent.columbae* was isolated from 50%, 90% and 70% of kofta, beef burger and Sausage Street vended sandwiches, respectively. The aforementioned organisms were isolated from 40%, 80% and 60% of examined kofta, beef burger and sausage sandwiches collected from restaurants, *Ent.cecroum* was isolated from 10% of both street vended kofta sandwiches and sausage sandwiches collected from restaurants, *Ent.mundtii* was isolated from 20% and 40% of street vended kofta sandwiches and kofta, sandwiches collected from restaurants respectively, also could be isolated from 20% of street vended sausage sandwiches, *Ent.Hirae* was isolated from 30% of kofta sandwiches collected from restaurants and from 10% of street vended sausage sandwiches, while *Ent.facium* only was isolated from 10% of sausage sandwiches collected from restaurants.

Staphylococcus aureus is considered the third most important cases of food borne disease in the world (Normanno *et al.*, 2007), the presence of this pathogen in fast food puts consumers at high risk (Syne *et al.*, 2013).

It is evident from the results recorded in Table (5) that *Staph.aureus* was isolated with Prevalence rate 10%, 40% and 60% from examined kofta, beef burger and sausage street vended sandwiches respectively, while the organism could be isolated only from kofta

sandwiches collected from restaurants with an incidence of 10%, and could not be isolated from both of beef burger and sausage sandwiches collected from restaurants.

This results obvious that street vended sandwiches appeared to be the samples that recorded higher incidence of *Staph.aureus* than that recorded in sandwiches collected from restaurants. Statistical analysis revealed that there were highly significant difference in the incidence of isolated *staph.aureus* between streets vended examined samples and examined samples collected from restaurants (P< 0.01). In this respect Sharmila, (2011) reported that some vendors (in order to keep prices down) purchase cheap or adulterated ingredients containing unpermitted chemical additives from unauthorized suppliers which may further increase the risks associated with the food, also he reported that the serving utensils used at the vending site are often contaminated with *Staphylococcus* spp. which may have originated from the vendors hands.

Concerning *Staph.aureus* count, all examined kofta sandwiches and street vended sausage sandwiches showed count <10cfu/g.

Based on the microbiological guidelines of ready to eat food (CFS, 2014), all these sandwiches fell in the category satisfactory based on their total *Staph.aureus* count while the frequency distribution of the organism in the examined street vended burger sandwiches as recorded in table (6) revealed that 6 (60%) had count < 10 cfu/g and 2 (20%) had count 13 cfu/g, so 80% of these sandwiches fell in the category satisfactory based on their total *Staph.aureus* count, and the same table showed that 2 (20%) of these sandwiches had account 30 cfu/g so they fell in the category borderline based on their total *Staph.aureus* count.

Alzbeta and Lubomir (2012) reported that *Staphylococci* compete poorly with indigenous bacteria and are inhibited by the antagonistic activities of other organisms. There fore the presence of *staph.aureus* in foods must be considered in relation to the amount and types of the accompanying flora.

(Fahim *et al.*, 2015) reported that the incidence of isolated *Satph.aureus* in the examined samples of street vended meat product sandwiches was recorded in sausage (55%) and beef-burger (40%) they were nearly similar to the obtained results in this study, while he could isolate the organism from (45%) of kofta sandwiches which was higher than that obtained in this study. Also he found that the mean values of *Staph.aureus* count (cfu/g) in the examined samples of kofta, beef-burger and sausage sandwiches were 8.13x10², 7.54x 10² and 1.96x10³ respectively, they were higher than that obtained in this study, and he

reported that 52.5% of the total examined samples fell in the category borderline based on their total *Staph.aureus* count ($20 \leq 10^4$ cfu/g), it was a worse report than that obtained in this study.

Also higher results were obtained by Ibrahim-Hemmat *et al.* (2014) who found that the mean values of *Staph.aureus* count in the examined samples of kofta and sausage sandwiches collected from restaurants were 9.35×10^2 and 2.76×10^3 respectively. While, Ahmed, (1991), Tolba, (1994), and Mohamed, (2000) failed to detect and isolate *Staph.aureus* from any of the examined samples of heat treated meat products.

In general *Staph.aureus* isolated from fast foods was more likely comes from food handlers (Baumgartner *et al.*, 2014), moreover (Potter, 2001) reported that total *Staph.aureus* count can be taken as index of sanitary conditions under which the meat and its products are manufactured and handled.

E.coli used as an indicator microorganism because it provides an estimate of fecal contamination and poor sanitation during processing (Eisel *et al.*, 1997). Its presence in fast foods indicates that the food has been prepared under poor hygienic conditions (Khater-Dalia *et al.*, 2013).

From the results illustrated in table (7) it's obvious that the incidence of *E.coli* isolated from the examined samples were 10%, 10%, 20% and 10% for kofta sandwiches collected from restaurants, street vended burger sandwiches, street vended sausage sandwiches and sausage collected from restaurants respectively, while the organism could not be isolated from street vended kofta sandwiches and beef burger sandwiches collected from restaurants. *E.coli* was previously isolated from ready to eat meat products by (Fahim *et al.*, 2015) who could isolate the organism from Kofta, beef burger and sausage sandwiches with an incidence of 15%, 10% and 25% respectively.

Also data obtained in the same table revealed that the isolated serotypes of pathogenic *E.coli* from the examined samples of kofta sandwiches collected from restaurants was O₁₂₇: H₄ (10%), and the serotype O₂₆: H₁₁ (10%) was isolated from the examined samples of street vended burger sandwiches, while in the examined samples of street vended sausage sandwiches the serotypes O₂₆:H₁₁ (10%) and O₅₅: H₇ (10%) were identified, moreover the serotype O₁₁₁:H₂ could be isolated from sausage sandwiches collected from restaurants with a percentage of (10%). In this respect Hassanin *et al.* (2014) could isolate *E.coli* O₂₆, O₁₁₁: H₄ and O₁₂₇:H₆ from kofta sandwiches with a percentage of 13.3%, 6.7% and 6.7% respectively. Also, Fahim *et al.* (2015) could isolate *E.coli* O₁₁₁: H₄ and O₁₂₇: H₇ from street vended kofta sandwiches

with a percentage of 10% and 5% respectively and from beef burger sandwiches he could isolate *E.coli* O₅₅:H₇ and O₁₁₉: H₄ with a percentage of 5% for each, while from sausage sandwiches he could isolate *E.coli* O₂₆: H₁₁, O₅₅: H₇, O₁₁₁: H₄ and O₁₁₉: H₄ with a percentage of 5%, 5% 5% and 10% respectively.

In recent years, *E.coli* has become recognized as a serious food borne pathogen and has been associated with numerous outbreaks of disease in the UK, Japan and USA (Scotter *et al.*, 2000).

Some other genera of the family, *Enterobacteriaceae* could be isolated as shown in Table (8), that *Proteus mirabilis* was isolated from street vended burger sandwiches with an prevalence rate 30%, and *Klebsiella pneumoniae* was isolated with an prevalence rate 10% and 20% from kofta sandwiches collected from restaurants and street vended sausage sandwiches respectively, Also *Enterobacter aerogenes* was isolated with an prevalence rate 10% from kofta sandwiches collected from restaurants. These isolated genera of the family *Enterobacteriaceae* are normal flora of the intestinal tract and are considered opportunistic pathogens.

While *Salmonella* spp. could not be isolated from any of the examined samples. The results agreed with Khater – Dalia *et al.* (2013), who reported that no samples tested in their study were found to contain salmonella spp.

CONCLUSION AND RECOMMENDATION

The results of the present study revealed the occurrence of enteropathogenic *E.coli* and *staph.aureus*, also revealed presence of some sandwiches with borderline quality due to their APC, in addition to the contamination with Enterococci. Occurrence of these pathogens in fully ready-to-eat sandwiches render the quality of the foods examined inadequate. Relevant authorities should educate food handlers on good personal hygiene and good manufacturing practices, which are sure ways of reducing the likelihood of the foods serving as vehicles for food-borne illnesses.

The above mentioned hazards can be minimized to a great extent simply by monitoring the microbiological quality of food and creating awareness among the people about the fundamental principles of sanitation and hygienic quality of food.

Although governments throughout the world are attempting to improve the safety of food supply, the occurrence of food borne disease remain a significant health issue in both developed and developing countries (WHO, 2011).

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دور الوجبات السريعة في نقل بعض المخاطر البكتيرية للمستهلك

لبنى محمد إبراهيم، أزهار محمد حسن

E-mail: ghada02468@yahoo.com

Assiut University web-site: www.aun.edu.eg

لقد تم جمع ٣٠ عينة من الساندوتشات المعدة للأكل (الكفتة والبيف بيرجر والسجق) بمعدل ١٠ من كل نوع من الباعة الجائلين وجمع ٣٠ عينة أخرى من نفس المنتجات بمعدل ١٠ من كل نوع من المطاعم المختلفة ولقد جمعت كل هذه العينات من أماكن مختلفة من مدينة أسيوط وفحصت بكتريولوجيا لتقييم سلامتها. أظهرت النتائج أن المتوسطات الحسابية للميكروبات الهوائية للعينات التي تم فحصها من ساندوتشات الكفتة والبيف بيرجر والسجق التي تم جمعها من الباعة الجائلين كانت 1.0×10^4 ، 1.0×10^4 ، 1.0×10^4 وحدة/ جرام على التوالي وكانت هذه المتوسطات 1.0×10^4 ، 1.0×10^4 ، 1.0×10^4 وحدة/ جرام على التوالي في العينات التي جمعت من المطاعم واعتماداً على المواصفات القياسية الميكروبيولوجية للوجبات الجاهزة (من مركز سلامة الأغذية) وجد أن ٨٠% من ساندوتشات الكفتة التي جمعت من الباعة الجائلين و ٥٠% من هذه الساندوتشات التي جمعت من المطاعم كانت طبق المواصفات القياسية حسب العدد الكلي للميكروبات الهوائية وكذلك ساندوتشات البيف بيرجر حازت على نفس النتائج بينما بالنسبة لساندوتشات السجق كان ٢٠% من التي جمعت من الباعة الجائلين و ٨٠% من التي جمعت من المطاعم هي التي حازت على أن تكون طبق المواصفات القياسية حسب العدد الكلي للميكروبات الهوائية. وأوضحت نتائج عد الميكروب المعوي أن المتوسطات الحسابية له كانت 1.0×10^9 ، 1.0×10^6 ، 1.0×10^6 وحدة/ جرام على التوالي في العينات التي تم فحصها من ساندوتشات الكفتة والبيف بيرجر والسجق التي جمعت من الباعة الجائلين وكانت هذه المتوسطات 1.0×10^3 ، 1.0×10^3 ، 1.0×10^3 وحدة/ جرام في العينات التي جمعت من المطاعم ولقد تم عزل بعض السلالات من هذا الميكروب وهي:

Ent.columbae, *Ent.cecorum*, *Ent. Mundtii*, *Ent. Hirea* and *Ent.Facium*.

وتم عزل الميكروب العنقودي الذهبي بنسب ١٠%، ٤٠%، ٦٠% على التوالي من العينات التي تم فحصها من ساندوتشات الكفتة والبيف بيرجر والسجق التي جمعت من الباعة الجائلين وكانت نسبة عزل الميكروب ١٠% من ساندوتشات الكفتة التي جمعت من المطاعم بينما لم يتم عزله من كل من ساندوتشات البيف بيرجر والسجق التي جمعت من المطاعم واعتماداً على المواصفات القياسية الميكروبيولوجية للوجبات الجاهزة (من مركز سلامة الأغذية) وجد أن كل ساندوتشات الكفتة التي فحصت وساندوتشات السجق التي جمعت من الباعة الجائلين و ٨٠% من ساندوتشات البيف بيرجر التي جمعت من الباعة الجائلين كانت طبق المواصفات القياسية حسب العدد الكلي للميكروب العنقودي الذهبي. وأيضاً تم عزل الميكروب القولوني بنسب مختلفة وكانت الأنماط المصلية المعزولة O_{55} :H₇، O_{127} :H₄، O_{26} :H₁₁، O_{111} :H₂