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Incidence of *Escherichia coli* and *Salmonella* in Ready to eat Foods

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ABSTRACT

A grand total of 90 random samples of ready-to-eat sandwiches of hawawshi, kofta, shawerma (meat), shiesh tawook, panee and shawerma (chicken) (15 of each) were collected from different fast food services in different districts in Menofia governorate. The incidences of *E.coli* were 46.7%, 40% and 33.3% of the examined ready to eat meat hawawshi, kofta and shawerma samples, respectively. Moreover, the isolated serotypes of *E.coli* in the examined ready to eat meat samples were O26, O111: H4, O119: H6, O124, O125: H21, O126 and O127:H6. While the incidences of *E.coli* in the examined ready to eat shiesh tawook, panee and shawerma were 26.7%, 33.3% and 33.3, respectively. Moreover, the isolated serotypes of *E.coli* from the examined ready to eat chicken samples were O26, O111: H4, O119: H6, O125: H21, O126 and O127:H6. The percentages of *Salmonella* in the examined ready to eat hawawshi, kofta, shawerma (meat), shiesh tawook, panee and shawerma (chicken), were 40%, 33.3%, 20%, 33.3%, 13.3% and 20%, respectively. Moreover, the isolated serotypes of *Salmonella* in the examined ready to eat samples were *S. typhimurium*, *S. muenster*, *S. enteritidis*, *S. heidelberg*, *S. dublin*, and *S. haifa*. The public health significance of the isolated organisms from the examined ready-to-eat sandwiches was discussed as well as some recommendations to ensure safety and quality of meat sandwiches prepared in fast food services were outlined.

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1. INTRODUCTION

Ready-to-eat (RTE) foods are processed foodstuffs which have gained popularity in recent times because they can be ingested without further thermal treatments (Rodriquez *et al.*, 2010). Ready-to-eat meat products are highly demanded due to their high biological value, reasonable price, agreeable taste and easily serving. Meat products are considered as excellent sources of high quality protein, minerals and vitamins (WHO, 1984; Mosupy *et al.*, 1998). In Egypt, the most ready - to - eat sandwiches sold in street vendors and fast food restaurants are kofta, shawerma and El- Hawawshi. 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). *Salmonella* is found worldwide and universally recognized as zoonotic agent. Many foods particularly of animal origin and those subjected to sewage pollution had been identified and must be taken into considerations as a vehicle for transmitting such pathogen to human being (ICMSF, 2006). Therefore, the aim of present study was to throw out light on the incidence of *Escherichia coli* and *Salmonella species* in ready to eat foods and isolation and identification of *Escherichia coli* and *Salmonella species*.

2. Material and Methods

2.1. Collection of samples: A grand total of ninety random samples of ready to eat

meat and chicken sandwiches classified into 45 samples of meat sandwiches (hawawshi, kofta and shawerma) and 45 samples of chicken sandwiches (shawerma, shiesh tawook and panee) were collected from different fast food restaurants with different sanitation levels at El- Menofia governorate. Samples were aseptically collected in sterile polyethylene bags. All samples were examined bacteriologically for detection of *E. coli* and *Salmonella*.

2.2. Isolation and identification of *E. coli*:

The technique recommended by APHA (1992) by using Eosin Methylene Blue (EMB) agar media. Suspected colonies for *E. coli* were morphologically and biochemically identified.

2.3. *Serotyping of E. coli*: *E. coli* isolates were serotyped in animal health research institute according to Kok *et al.* (1996) by using rapid diagnostic *E. coli* antisera sets (DENKA SEIKEN Co., Japan) for diagnosis of enteropathogenic types.

2.4. *Isolation and identification of Salmonella*: The technique recommended by ISO (2002b) by using Xylose Lysine Desoxycholate (XLD) agar media. Suspected colonies for *Salmonella* were morphologically and biochemically identified.

2.5. *Serotyping of Salmonella*: *Salmonella* isolates were serotyped in animal health research institute according to Kauffman – White scheme (Kauffman, 1974) for the determination of Somatic (O) and flagellar (H) antigens using *Salmonella* antiserum (DENKA SEIKEN Co., Japan).

3. RESULTS

The results recorded in Tables (1& 2) revealed that the incidences of *E. coli* in the examined ready to eat samples were 46.7%, 40%, 33.3%, 26.7, 33.3% and 33.3 % for hawawshi, kofta, shawerma (meat) and shiesh tawook, panee and shawerma

(chicken), respectively. Data in Table (3) revealed that the serologically identified *E. coli* serotypes isolated from the examined samples of hawawshi were O26 (13.3%), O111: H4 (6.7%), O119: H6 (6.7%), O125: H21 (6.7%) and O127:H6 (13.3%), while, in the examined kofta samples were O26 (13.3%), O111: H4 (6.7%), O124 (13.3%) and O127:H6 (6.7%), Moreover, in the examined samples of shawerma (meat) were 3 isolates O26 (6.7%), O125:H21 (13.3%) and O126 (13.3%). Data in Table (4) revealed that the serologically identified *E. coli* serotypes isolated from the examined samples of shiesh tawook were O111: H4 (13.3%) and O127:H6 (13.3%), while in the examined samples of panee were 3 O119: H6 (13.3%), O125:H21 (6.7%) and O127:H6 (13.3%), Moreover, in the examined samples of shawerma (chicken) samples O26 (6.7%), O125:H21 (13.3%) and O126 (13.3%).

The results recorded in Tables (5& 6) revealed that the incidences of *Salmonella* in the examined ready to eat samples were 40%, 33.3%, 20%, 33.3%, 13.3% and 20 % for hawawshi, kofta, shawerma (meat) and shiesh tawook, panee and shawerma (chicken), respectively.

Data in Table (7) revealed that the serologically identified *Salmonella* serotypes isolated from the examined samples of hawawshi were *S. typhimurium* (13.3%), *S. dublin* (13.3%) and *S. enteritidis* (13.3%), while in the examined samples of kofta were *S. typhimurium* (13.3%), *S. enteritidis* (6.7%) and *S. haifa* (13.3%), Moreover, in the examined samples of shawerma (meat) were *S. typhimurium* (6.7%) and *S. enteritidis* (13.3%). Data in Table (8) revealed that the serologically identified *Salmonella* serotypes isolated from the examined samples of shiesh tawook were *S. muenster* (20%), and *S. enteritidis* (13.3) while, in the examined samples of panee were *S. typhimurium* (13.3%), Moreover, in the examined samples of shawerma (chicken) were *S. enteritidis* (13.3%) and *S. hidelberg* (6.6%).

Table (1): Incidence of *E. coli* in the examined ready to eat meat samples (n=15)

Meat Products	Positive Samples	
	No.	%
Hawawshi	7	46.7
Kofta	6	40
Shawerma (meat)	5	33.3
Total	18	40

Table (2): Incidence of *E. coli* in the examined Ready to eat chicken samples (n=15)

Chicken Products	Positive Samples	
	No.	%
Sheish tawook	4	26.7
Panee	5	33.3
Shawerma (chicken)	5	33.3
Total	14	31.1

1. DISCUSSION

The presence of *E.coli* in food of animal origin is considered as indicator of faults during preparation, handling, storage or service (Tebbut, 1999). Although, *E.coli* is readily killed by temperature above 55°C, serious incidents occurred in such products, which reflects high level of abusing even to fecal contamination occurrence, Cross contamination between raw foods and cooked one was evident in the main preparation areas (Varnam and Evans, 1991). The current results for hawawshi were higher than those obtained by Ibrahim-Ghada (2001) (27.2%), Ismail-Soad (2006) (17.3%), El- Rayes Amina (2008) (16%). While, the current results for kofta

sandwiches were higher than those obtained by Hassan (1991) (0%), El-Taher- Omyma (1998) (25%), El-Rayes-Amina (2008) (20%), and Al- Mutairi (2011) (28%), but the similar to those obtained by El-Mossalami (2003) (40%). Moreover, the current results for shawerma (meat) were higher than those obtained by Vazgecer *et al.* (2004) (31%) and Al- Mutairi (2011) (20%), but lower than those obtained by El-Gohary (1993) (78%). Furthermore, the current results for shawerma (chicken) sandwiches were higher than those obtained by Sharaf- Eman and Sabra- Sherifa (2012) (20%). The variation in the results may be due to the differences in manufacture practices, handling from producers to

Table (3): Serotyping of *E. coli* isolated from the examined ready to eat meat samples (n=15).

<i>E. coli</i> serotype	Hawawshi		Kofta		Shawerma (meat)		Total	
	No.	%	No.	%	No.	%	No.	%
O26	2	13.3	2	13.3	1	6.7	5	33.3
EHEC								
O111 : H4	1	6.7	1	6.7	----	----	2	13.3
O119 : H6	1	6.7	---	----	----	----	1	6.7
O124 EIEC	---	---	2	13.3	----	----	2	13.3
O125: H21 ETEC	1	6.7	---	---	2	13.3	3	20
O126	---	----	---	---	2	13.3	2	13.3
O127:H6	2	13.3	1	6.7	---	---	3	20
Total	7	46.7	6	40	5	33.3	18	40

Table (4): Serotyping of *E. coli* isolated from the examined ready to eat chicken samples (n=15).

<i>E. coli</i> serotype	Sheish tawook		Panee		Shawerma (chicken)		Total	
	No.	%	No.	%	No.	%	No.	%
O26	----	----	----	----	1	6.7	1	6.7
O111 : H4	2	13.3	----	----	----	----	2	13.3
O119 : H6	----	----	2	13.3	----	----	2	13.3
O125: H21	----	----	1	6.7	2	13.3	3	20
O126	----	----	---	---	2	13.3	2	13.3
O127:H6	2	13.3	2	13.3	---	---	4	26.7
Total	4	26.6	5	33.3	5	33.3	14	31.1

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Table (5): Incidence of *Salmonella* in the examined ready to eat meat samples (n=15)

Meat Product	Positive Samples	
	No.	%
Hawawshi	6	40
Kofta	5	33.3
Shawerma (meat)	3	20
Total	14	31.1

Table (6): Incidence of *Salmonella* in the examined ready to eat chicken samples (n=15).

Chicken Products	Positive Samples	
	No.	%
Sheish tawook	5	33.3
Panee	2	13.3
Shawerma (chicken)	3	20
Total	10	22.2

Table (7): Serotyping of *Salmonella* isolated from the examined ready to eat meat samples (n=15).

Identified strains	Hawawshi		Kofta		Shawerma (meat)		Total	
	No.	%	No.	%	No.	%	No.	%
<i>Salmonella typhimurium</i>	2	13.3	2	13.3	1	6.7	5	33.3
<i>Salmonella dublin</i>	2	13.3	----	----	----	----	2	13.3
<i>Salmonella enteritidis</i>	2	13.3	1	6.7	2	13.3	5	33.3
<i>Salmonella haifa</i>	----	----	2	13.3	----	----	2	13.3
Total	6	40	5	33.3	3	20	14	31.1

Table (8): Serotyping of *Salmonella* isolated from the examined ready to eat chicken samples (n=15).

Identified strains	Shiesh tawook		Panee		Shawerma (Chicken)		Total	
	No.	%	No.	%	No.	%	No.	%
<i>Salmonella typhimurium</i>	----	----	2	13.3	----	----	2	13.3
<i>Salmonella muenster</i>	3	20	----	----	----	----	3	20
<i>Salmonella enteritidis</i>	2	13.3	----	----	2	13.3	4	26.6
<i>Salmonella hidelberg</i>	----	----	----	----	1	6.6	1	6.6
Total	5	33.3	2	13.3	3	20	10	22.2

consumers and the effectiveness of hygienic measures applied during production. Practically, all food of animal origin may be a vehicle transmission of *salmonellae* to man. Meat and chicken products may be contaminated by human excreta at any step in the chain of processing during handling from raw material in the preparation of such food in kitchen (Fathi *et al.*, 1994). *Salmonella* was recovered in meat products by many investigators such as Abd- Aziz (1987) (10%), Ahmed (1988) (8%), El-Mossalami *et al.* (1989) (6%), El-Mossalami (2003) (5%), Torkey (2004) (5%), and Siriken *et al.* (2006) (7%). The current results for hawawshi disagree with those reported by Refaie and Moustafa (1990) (0%) and Ismail Soad (2006) (0%). Also, *Salmonella* failed to be detected in the examined kofta samples by Al-Mutairi (2011), but *Salmonella kentucky* (4%) was isolated from the examined shawerma samples. It can be concluded that the presence of these microorganisms in high prevalence not only renders these sandwiches of inferior quality and unfit for human consumption, but also as an indication for fecal contamination and

possibility of presence of associated enteric pathogens.

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مجلة بنها للعلوم الطبية البيطرية



مدي تواجد ميكروبات الايشيريشيا كولاي والسالمونيلا في الاغذية الجاهزة للاكل

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الملخص العربي

تم جمع 90 عينة عشوائية من سندوتشات اللحوم والدواجن الجاهزة للأكل من اما كن تجهيز الوجبات السريعة بمحافظة المنوفية التي شملت ستة انواع من السندوتشات هي حواشي، كفتة، شاورمة لحوم، شيش طاووق، بانيه، وشاورمه دجاج بواقع 15 عينة من كل نوع ولقد تم نقل هذه العينات علي وجه السرعة وتحت ظروف صحية مشددة الي المعمل لمعرفة الحالة البكتيرية لها من حيث نسبة الايشيريشيا كولاي والسالمونيلا. وقد اوضحت النتائج انه تم عزل ميكروب الايشيريشيا كولاي بنسب 46.7%، 40%، و33.3% من عينات الحواشي، الكفتة، والشاورمة لحوم علي التوالي. وقد تم تصنيف عترات الايشيريشيا كولاي التي تم عزلها من سندوتشات اللحوم كالاتي: O26, O111: H4, O119: H6, O124, O125: H21, O126, O127: H6
وقد اوضحت النتائج انه تم عزل ميكروب الايشيريشيا كولاي بنسب 26.7%، 33.3%، و33.3% من عينات الشيش طاووق، البانيه، والشاورمة دجاج علي التوالي. وقد تم تصنيف عترات الايشيريشيا كولاي التي تم عزلها من سندوتشات الدجاج كالاتي: O26, O111: H4, O119: H6, O125: H21, O126, O127: H6
بينما كانت نسبة التلوث بميكروب السالمونيلا في عينات حواشي، كفتة، شاورمة لحوم، شيش طاووق، بانيه، وشاورمه دجاج هي 40%، 33.3%، 20%، 33.3%، و13.3%، و20% علي التوالي. وقد تم تصنيف عترات السالمونيلا التي تم عزلها من سندوتشات اللحوم والدواجن كالاتي: S. typhimurium, S. muenster, S. enteritidis, S. heidelberg, S. dublin, S. Haifa. وقد تم دراسة ومناقشة الاهمية الصحية للميكروبات المعزولة وكذلك الشروط الصحية الواجب توافرها اثناء اعداد وتقديم هذه السندوتشات لتجنب خطر هذه الميكروبات.

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