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Incidence of Salmonellae and E. coli in Meals served in Egyptian Hotels

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ABSTRACT

A total of 120 random samples of beef kofta, chicken panne, and fish-based meal (sushi) (40 of each) served in Egyptian hotels located in Cairo governorate, Egypt had collected to evaluate the incidence and serologically detection of *E. coli* organism and also salmonellae organisms. the results of serological identification of the *E. coli* isolates, EPEC strains were the most prominent represented by O_{17}: H_{18}, O_{55}:H_7, O_{86}, O_{114}:H_4 and O_{146}:H_{21}; then EHEC (O_{26}:H_{11}, O_{91}: H_{21}, O_{111}:H_2), followed by ETEC (O_{125}:H_{21} and O_{128}:H_2), and finally EIEC (O_{159}). Therefore, 32(26.6%) of the examined samples were considered unfit for human consumption; in details, 8(20%), 10(25%) and 14(35%) of the examined kofta, panée and sushi samples were rejected respectively. While Salmonella species was also detected in 20 (16.6%) of the examined samples represented by 5 (12.5%), 9 (22.5%) and 6 (15%) samples of beef kofta, chicken panée and sushi meals, respectively. Serological identification of salmonella isolates revealed detection of *S. Essen, S. Enteritidis, S. Heidelberg, S. Infantis, S. Kentucky, S. Larochelle, S. Tsevie* and *S. Typhimurium*. Therefore, 20 (16.6%) of the examined samples were unfit for human consumption due to carry salmonella species**,** the important of isolated strains and their public importance was discussed.

1. INTRODUCTION

The nutritional value of meat generally derived from its high protein content; fats found in meats can also be a valuable source of energy for the body. In add to meat contains minerals, like iron, phosphorous and zinc, in add to vitamin B complex and others important vitamins.

Pathogenic microorganisms are widely present in soil, water, animals and people. It presents on hands, cloths, utensils and cutting boards, the slight contact can transfer them to meat and cause food-borne diseases. Moreover, raw food, especially meat, poultry and their extracts have dangerous microorganisms can be transferred into other food during preparation, handling and storage (FAO/WHO, 2003 and Hanson *et al.,* 2011).

Meat meals can be exposed to several ways of contamination through improper practices during production, storage and handling. This risk of contamination to these meals increasing by storage of food at ambient temperature, by using insufficiently high temperature for re-heating the food and also adding contaminated ingredients at stage which no further heat treatment applied (Ehirl*et al*., 2001).

The temperature at which ready to eat meat meals must keep high for any time. To avoid the danger zone in the food thermometer (between 5 and 60°C) to inhibit the multiplication of the food poisoning bacteria. Therefore, if spend meat meals for short time through this zone (4 and 60°C) will reduce the chances of food poisoning (SFA, 2020).

Bacterial food-borne disease increased when meat meals were prepared in kitchens, it will lead to risk due to the number of individuals which using the kitchens and the lack of feelings of responsibility and the difference in the hygienic standards for the users in this kitchen (Sharp and Walker, 2003).

One of the major causing of a public health problem associated with fish and fishery products is Salmonella. A monitoring of it had been suggested as a measure of fish quality. Also, risk management decisions should take into account the whole food chain from primary production to consumption and should be implemented in the context of appropriate food safety infrastructures, for instance regulatory enforcement, food product tracing and traceability systems. In the fish processing chain managing risks should be based on scientific knowledge of the microbiological hazards and the understanding of the primary production and processing (Popovic *et al.*,2010).

EIEC, ETEC and EPEC organisms are present in Human being and considered as the primary reservoir to it. EPEC and ETEC organisms are commonly isolated in meals specially meat meals from developing countries and their presence are due to poor hygiene measures (Desmarchelier and Fegan, 2003).

Therefore, the study planned to evaluate the incidence of salmonellae and *E. coli* of some examined meat meals in Egyptian hotels through the detection, isolation and identification Enteropathogenic (*E. coli*) and *Salmonella* organisms.

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2. MATERIAL AND METHODS

Preparation and collection of the samples (ISO 6887-1, 2017):

120 samples of meat meals of Beef kofta, Chicken panne and Sushi fish (40 each) were collected from different Egyptian hotels located in Cairo Governorate, Egypt to be examined bacteriologically. Each sample have been packed in plastic bag, transferred as rapidly as possible to the laboratory in an icebox with a minimum period of delay, and subjected to the following examination:

Sampling preparation:

25 grams of each sample was taken under aseptic condition homogenized after using sterile homogenizer (MPW0302, Poland), then add 225ml of sterile buffered peptone water (0.1%) for 2 minutes at 1500- 2000 rpm. to provide dilution of 10^{-1} then decimal serial dilutions were prepared.

Isolation and identification of E. coli according to ICMSF (1978).

Screening of Salmonellae has been conducted according to ISO (6579, 2017)

Serological identification according to Kauffman (1974).

3. RESULTS

Table 1 Incidence of the E. coli isolated from the examined samples served in the Egyptian hotels (n=40).

Strain characteristics	Meals / *E. coli* strains	Sushi Fish		Chicken Panne		Beef Kofta	
		No.	No.	No.	No.	No.	%
EPEC	O17 : H18	-	-	1	2.5	-	-
EHEC	O26 : H11	1	2.5	-	-	2	5
EPEC	O55 : H7	3	7.5	-	-	1	2.5
EPEC	O86	-	-	-	-	1	2.5
EHEC	O91 : H21	-	-	3	7.5	-	-
EHEC	O111 : H2	-	-	1	2.5	3	7.5
EPEC	O114 : H4	1	2.5	2	5	-	-
ETEC	O125 : H21	2	5	-	-	-	-
ETEC	O128 : H2	4	10	2	5	1	2.5
EPEC	O146 : H21	1	2.5	1	2.5	-	-
EIEC	O159	2	5	-	-	-	-
		14	35	10	25	8	20

EPEC (Enteropathogenic E. coli),
ETEC (EnterotoxigenicE.coli), EIEC(EnteroinvasiveE.coli)
EHEC (Enterohaemorrhagic E. coli)

Table 2 Edibility for the examined samples of meals served in the Egyptian hotels based on their contamination with E. coli (n=40).

Meat meals	Unaccepted samples		Accepted samples	
	%	No.	%	No.
Beef Kofta	20	8	80	32
Chicken Panne	25	10	75	30
Sushi Fish	35	14	65	26
Total	26.6 %	32	73.3%	88

*Egyptian Organization for Standardization (2005)

Table 3 Incidence for Salmonellae which isolated from samples of different meals served in the Egyptian hotels (n=40).

Samples / *Strains*	Beef Kofta		Chicken Panne		Sushi Fish		Group	Antigenic structure	
	No.	%	No.	%	No.	%		O	H
S. Essen	-	-	-	-	1	2.5	B	4,12	g,m : -
S. Enteritidis	1	2.5	2	5	1	2.5	D1	1,9,12	g,m : -
S. Heidelberg	1	2.5	-	-	-	-	B	1,4,5,12	r : 1,2
S.Infantis	-	-	-	-	1	2.5	C1	6,7	r : 1,5
S. Kentucky	-	-	3	7.5	-	-	C3	8,20	i : Z6
S. Larochelle	-	-	1	2.5	-	-	C1	6,7	e,h:1,2
S.Tsevie	1	2.5	1	2.5	1	2.5	B	4,5	i : e,n,z15
S.Typhimurium	2	5	2	5	2	5	B	1,4,5,12	i : 1,2
Total	5	12.5	9	22.5	6	15			

Table 4 Edibility of the examined samples of meals served in the Egyptian hotels based on their contamination with Salmonellae (n=40).

Meat meals	Unaccepted samples		Accepted samples		Salmonella /25g*
	%	No.	%	No.	
Beef Kofta	12.5	5	87.5	35	Free
Chicken Panne	22.5	9	77.5	31	Free
Sushi Fish	15	6	85	34	Free
Total	16.6%	20	83.3%	100	

4. DISCUSSION

Food reputation is beliefs about the effects of food on its consumers. The health and safety of hotel guests is considering a vital driver for the business and reputation of the hotel brand. Studies references have shown that 10% of travelers to foreign destinations become ill after consuming contaminated food or water, so most of them will not return to this hotel where they became ill in it , this will effect on its reputation

Food and beverage department staff' knowledge, attitudes and self-reported practices (KAP) create a competitive advantage as a quality differentiator for visitors, hotels, operators, and travel agencies. Food safety has become a subject of enormous interest. In the latest years, offering safe food has become the obsession that irritates food enterprises in developed and poor countries. Where (WHO) recorded that millions of people in developed and developing countries had been infected with food borne diseases. Therefore, everyone contact with food needs to know how to manage the food safely. So, any person starts work as a food handler, must have full knowledge and parameters of food safety & hygiene (FSIS, 2008).

Table (1) illustrated the results of serological identified of the *E. coli* isolates, EPEC strains were the most prominent represented by O_{17}: H_{18}, O_{55}:H_7, O_{86}, O_{114}:H_4 and O_{146}:H_{21}; followed by EHEC (O_{26}:H_{11}, O_{91}: H_{21}, O_{111}:H_2), followed by ETEC (O_{125}:H_{21} and O_{128}:H_2), and EIEC (O_{159}). Therefore, 32(26.6%) of the examined samples were considered unfit for human consumption; in details, 8(20%), 10(25%) and 14(35%) of the examined kofta, panne and sushi samples were rejected because of having *E. coli*, respectively (Table, 2).

Escherichia coli involving in poisoning of meat products as following: (EPEC), (ETEC), (EIEC) and (EHEC). The severe symptoms mainly accompanied with *E. coli* infection are haemolytic uraemic syndrome (HUS) and gastro-enteritis.

The main toxins involved in these cases are shiga toxin 1 and shiga toxin 2 (Heyderman,2001).
Regarding results obtained for *E. coli* may be compared with those recorded by Hassan *et al.* (2016) , with prevalence of 33.3% and serotypes O_{55}:K_{59}, O_{111}:K_{58}, O_{124}:K_{72} and O_{127}:K_{63} in kofta samples), while Hassanin*et al.* (2015) (33.3% with serotypes of O_{26}:H_{11}, O_{111}:H_4, O_{114}:H_{21} and O_{128}:H_2 of kofta samples), in add to Liang (2016) (10 CFU/g with prevalence of 5% of sushi samples), furthermore Shaltout *et al.*(2018) (46.6% of panne samples), Moreover ,Gaafar (2020) (detected *E. coli* in 10 and 6.66% of the examined kofta and panne samples with serotypes of O_{128}:H_2 and O_{26}:H_{11} and O_{78} andO_1:H_7 isolated from koft and panne samples , respectively.
Salmonellae were found that during 2003, Salmonella infections were responsible for 30% of 23,250 notifications of foodborne diseases in Australia Oz Food Net Working Group (2003), with symptoms characterized by dramatic diarrhea, which is sometimes accompanied by abdominal pain, nausea, vomiting, headaches, chills, myalgia and low-grade fever (Ziprin and Hume 2001).
Regarding the results in Table (3), salmonella species has been detected in 20 (16.6%) of the examined samples represented by 5 (12.5%), 9 (22.5%) and 6 (15%) samples of beef kofta, chicken panne and sushi meals, respectively. Serological identification of salmonella isolates revealed detection of *S. Essen*, *S. Enteritidis, S. Heidelberg, S. Infantis, S. Kentucky, S. Larochelle, S. Tsevie* and *S. Typhimurium*. Therefore, 20 (16.6%) of the examined samples were unfit for human consumption because of having salmonella species as recorded in Table (4).
While in other studies salmonellae was be detected in different samples with various prevalence, for example, Hassan *et al.* (2015) found salmonella in 26.67% of the examined kofta samples, with serotypes *S. enteritidis, S. typhimurium* and *S. anatum*), while Shaltout *et al.*(2018) found salmonella in 20 % of the examined panne samples, with serotypes *S. tsevie, S. kentucky, S. typhimurium, S. apeyeme* and *S. enteritidis*) but Liang *et al.* (2016) recorded that none of the examined sushi samples revealed salmonella contamination.

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