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OCCURRENCE OF ESCHERICHIA COLI O157 IN GROUND MEATCOMMERCIALIZED IN LEBANESE URBAN CITIES

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Abstract

Escherichia coli O157:H7 (E. coli O157:H7) has been recognized as a major cause of diarrhea and hemolytic- uremic syndrome (HS). The consumption of raw or undercooked meat of bovine origin has been the most common mean of transmitting this organism. No screening of E.coli has been performed in the ground meat commercialized in the Lebanese market. Therefore, the purpose of this study is to evaluate the prevalence of E. coli serotype O157:H7 recovered from ground fresh raw meat collected from different butcheries in Lebanese Urban cities. A total of 73 samples of fresh ground meat was collected from Sin el fil area (n=23), Hadath (n=16), Ghoubayri (n=16) and Antelias (n=18), and investigated for the presence of E. coli O157: H7. E. coli O157:H7 was isolated in 16 (22%) out of 73 meat samples examined. This high prevalence was variable between the different cities, with the highest one in Ghoubayri (43%), followed by Sin el fil (21%), Hadath (12%) and Antelias (11%). This study revealed the presence of E. coli O157:H7 in retail raw meats reaching consumers, especially in crowded urban city such as Ghoubayri. This result is an indication of the poor hygienic level in the different butcheries localized in the Lebanese urban cities, thus reflecting possible risks of infection to people through the consumption of fresh raw/under-cooked meat.

Keywords

Occurence, E.coli, meat, Lebanon, Food safety

OCCURRENCE OF ESCHERICHIA COLI O157 IN GROUND MEAT COMMERCIALIZED IN LEBANESE URBAN CITIES

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ABSTRACT: *Escherichia coli O157:H7 (E. coli O157:H7) has been recognized as a major cause of diarrhea and hemolytic- uremic syndrome (HS). The consumption of raw or undercooked meat of bovine origin has been the most common mean of transmitting this organism. No screening of E.coli has been performed in the ground meat commercialized in the Lebanese market. Therefore, the purpose of this study is to evaluate the prevalence of E. coli serotype O157:H7 recovered from ground fresh raw meat collected from different butcheries in Lebanese Urban cities. A total of 73 samples of fresh ground meat was collected from Sin el fil area (n=23), Hadath (n=16), Ghoubayri (n=16) and Antelias (n=18), and investigated for the presence of E. coli O157: H7. E. coli O157:H7 was isolated in 16 (22%) out of 73 meat samples examined. This high prevalence was variable between the different cities, with the highest one in Ghoubayri (43%), followed by Sin el fil (21%), Hadath (12%) and Antelias (11%). This study revealed the presence of E. coli O157:H7 in retail raw meats reaching consumers, especially in crowded urban city such as Ghoubayri. This result is an indication of the poor hygienic level in the different butcheries localized in the Lebanese urban cities, thus reflecting possible risks of infection to people through the consumption of fresh raw/under-cooked meat.*

1. INTRODUCTION

Nowadays, Food borne outbreaks represent a major health problem especially in developing countries such as Lebanon, where food safety scandals are a serious concern. Foodborne outbreaks are of increasing occurrence in Lebanon and in response to that, the Ministry of Public Health have done a series of inspections and publicized a list of restaurants, supermarkets and other food provider services that did not meet the ministry's food regulation standards (Institute of Health Management and Social Protection, USJ, WHO, & MoPH, 2012).

Different factors might increase the food-borne disease outbreak origin challenging, e.g. population growth, changing eating habits, globalization of food supply chains, production and processing innovations, and microbiological adaptation (Newell et al., 2010).

Literature studies have shown that 75% of food borne illness outbreaks is related to improper food handling practices in food establishments (Gizaw, Gebrehiwot, & Teka, 2014). Poor hygiene status among food handlers is being considered as one of the major risk factors in the transmission of bacteria and contamination of food thus posing serious health risks to consumers (Scallan et al., 2011). Consequently, food safety training should be implemented on food handlers to increase awareness about the proper hygienic practices (Tan, Lee, & Mahyudin, 2014).

Shiga-toxin producing Escherichia coli are currently considered as important emerging food-borne bacterial pathogens of public health concern. They are causing sporadic and epidemic human cases of hemorrhagic colitis (HC), which can lead to severe and life threatening hemolytic and uremic syndrome (HUS), especially in young infants (Madic, 2010). The majority of the cases are due to the ingestion of food or water contaminated with STEC strains belonging to the serotype O157:H7. The Centers for Disease Control and Prevention reported Escherichia coli as one of the three most common food-borne infections (CDC., 2008). Traditional methods for the detection of E. coli O157 use enrichment, followed by isolation on Sorbitol MacConkey Agar. The methods are time-consuming, and competing flora may obscure O157 colonies thereby giving rise to false negative results. Recently, many companies have developed rapid

methods for detection that are specific, faster and more sensitive than traditional culture methods. Enzyme-linked immunosorbent fluorescent assays (VIDAS-UP) is one of these methods (HILDA NYATI, ANNET HEUVELINK & ZWARTKRUIS, 2012).

Since Escherichia coli (E. coli) is being considered as one of the major causes in food borne outbreaks in Lebanon (Harakeh et al., 2005), we aimed in this study at screening the prevalence of E. coli serotype O157:H7 recovered from ground fresh raw meat collected from different butcheries in Lebanese Urban cities Sin el fil area, Hadath, Ghoubayri, and Antelias. The samples will be tested by a rapid method, followed by a confirmation with the reference method of E.coli identification (ISO EN-16654)

2. MATERIALS AND METHODS

2.1 Food outbreak prevalence

A screening was conducted with the Ministry of Public Health to check the prevalence of foodborne outbreaks among Lebanese hospitals between January 2014 till January 2015.ength of paper title may not exceed 80 characters. Paper title is typed bold uppercase letters, 14 pt., and placed centered. Author(s) name(s) should be typed in plain capital letters, size 12, not bold, centered, and placed one space under the paper title with footnote giving the author(s) title(s) and affiliation(s).

2.2 Sample size and sampling procedure

A total of 73 samples of fresh ground meat were collected to test the prevalence of E. coli serotype O157:H7 recovered from ground fresh raw meat collected from different butcheries in Lebanese Urban cities. The samples were randomly collected from four Lebanese urban cities, Sin el fil area (n=23), Hadath (n=16), Ghoubayri (n=16) and Antelias (n=18). The samples were stored at a temperature 1-4°C, the subjected to the analysis within 24 hours.

2.3 Microbiological procedure

The fresh ground meat samples were subjected to a rapid screening, VIDAS UP, for the detection of E. coli O157. Afterwards, the samples were subjected to the reference method of E. coli O157 identification, which is the ISO-EN-16654.

3. RESULTS AND DISCUSSION

3.1 Food-borne Outbreaks in Lebanon

Captions In collaboration with the ministry of Public Health, a screening of the Foodborne outbreak cases among the hospitals in Lebanon was conducted between January 2014 and 2015 (Table 1). During this period, 109 foodborne outbreak cases were found. In 2014, 39 cases were identified, with 10 out of 39 were mainly due to contaminated chicken, 8 were related to the raw meat. This number almost doubled in 2015 to reach 70 cases in total, with 20 due to chicken and 15 due to raw meat. Chicken and raw meat are potential vehicles for transmitting food-borne diseases (Zhao et al., 2001). This screening is important since focusing on foods that are prominent in outbreaks will better guide the food industries and governments in targeting interventions (Crowe, Mahon, Vieira, & Gould, 2015). Consequently, there is a need to increase implementation of hazard analysis of critical control point (HACCP) in meat industries and consumer food safety education efforts.

Table 1. Prevalence of Foodborne outbreaks in Lebanon between January 2014 and 2015

Vehicle category	Number of outbreaks, 2014	Number of outbreaks, 2015
Chicken	**10**	**20**
Meat	**3**	**7**
Raw meat	**8**	**15**
Mayonnaise	**2**	**5**
Egg dishes	**2**	**3**
Cheese	**1**	**1**

Fish	**1**	**3**
Dessert	**4**	**4**
Arab sweets	**2**	**5**
Milk	**1**	**0**
Mixed vehicle	**5**	**7**
Total	**39**	**70**

3.2 Identification of pathogenic organisms in the food causing outbreaks

C After checking the main food source of the outbreaks, the identification of the involved pathogenic organisms becomes highly crucial for surveillance, prevention, and control of food-borne diseases.

Table 2 showed that Escherichia coli O157:H7, Staphylococcus aureus, Listeria monocytogenes and Salmonella spp. were detected in all the food samples (466), which is in correlation with the literature findings that show that these microorganisms are able to survive as potential food pathogens (Park, Lee, & Kim, 2006). The results showed that Escherichia coli is almost responsible of half of the detected contamination of food samples. Since most outbreaks with E.coli O157:H7 infection have been linked to foods of bovine origin (Abu-Ali et al., 2009), we decide to investigate further fresh ground meat from different locations located in Lebanese urban cities for their contamination with E.coli O157:H7.

Table 2. Microorganisms isolated from food causing foodborne outbreaks

Isolated microorganisms	**Number**	**%**
Escherichia coli	205	44
Staphylococcus aureus	107	23
Listeria monocytogenes	19	4
Salmonella	135	29
Total	466	100

3.3 E.coli occurrence in fresh ground meat located in different Lebanese Urban Cities

C Table 3 represents the E.coli serotype O157:H7 occurrence in fresh ground meat (n=73) located in different Lebanese Urban Cities, Sin el fil area (n=23), Hadath (n=16), Ghoubayri (n=16) and Antelias (n=18). E. coli O157:H7 was isolated in 16 (22%) out of 73 meat samples examined, which is in accordance with the literature data that showed that ground beef has been the food most of ten associated with E. coli O157 (Ateba &Bezuidenhout, 2008). This contamination could be due to the slaughtering process of the cattle which may contaminate the meat with the E. coli bacteria from the cattle intestine. Studies on cattle have shown that 2.8- 1000/3.3cattle carry E. Coli O157:H7. This latter has shown too survive in the cattle feces for up to 70 days (Wang, Zhao, & Doyle, 1996). The high prevalence was variable between the different cities, with the highest one in Ghoubayri (43%), followed by Sin el fil (21%), Hadath (12%) and Antelias (11%). This study confirmed the presence of E. coli O157:H7 in retail raw meats reaching consumers, especially in crowded urban city such as Ghoubayri. This result is an indication of the poor hygienic level in the different butcheries localized in the Lebanese urban cities, thus reflecting possible risks of infection to people through the consumption of fresh raw/under-cooked meat.

Table 3. E.coli occurrence in fresh ground meat located in different Lebanese Urban Cities

Samples (73)	%
Sin el fil area (n=23),	21
Hadath (n=16),	12
Ghoubayri (n=16)	43
Antelias (n=18)	11

4. CONCLUSIONS

The Surveillance for Foodborne Disease Outbreaks in Lebanon, suggests that chicken and meat has caused the most food-related sickness among the public. E. coli is the main pathogen contaminating meat during slaughter and processing. This study pointed to the high prevalence of E. coli in the meat distributed in many Lebanese Urban cities and suggest the need for proper control strategies for the prevention of contaminated animal products. Effective measures to promote safe food-handling practices could reduce poultry-associated outbreaks and illnesses.

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