

## SOME FOOD POISONING ORGANISMS IN STREET- VENDED ICE CREAM IN ALEXANDRIA

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### ABSTRACT

*Although ice cream is widely used all over the world especially in summer season and considered palatable to consumers especially children, it may constitute a serious public health hazard due to its contamination from a variety of sources with different types of microorganisms. Sixty random samples of frozen ice cream with chocolate, strawberry and vanilla flavor (20 each) were collected from street-vendors and hawkers in Alexandria city. The samples were examined for the incidence of some food poisoning organisms in ice cream products. The incidence of Bacillus cereus in the examined samples of street-v ended frozen ice cream with chocolate, strawberry and vanilla flavor was 20, 25 and 15%, respectively. Clostridium perfringens was detected in 10, 15, and 10% of examined ice cream, respectively. The mean counts of Enteropathogenic Escherichia coli (cfu/g)  $1.22 \times 10^4 \pm 0.4 \times 10^4$ ;  $4.1 \times 10^4 \pm 0.54 \times 10^4$  and  $1.08 \times 10^4 \pm 6.3 \times 10^3$  with respective incidence of 20, 25 and 15%. Comparing the results with Egyptian standards (1993) which stipulate that ice cream must be free from Laurous, it is clear that 30, 25, 20 % of examined street-vended ice cream samples with chocolate, strawberry and vanilla flavor did not comply with it, respectively. Yersinia enterocolitica could be isolated from only one % of street-vended ice cream samples with strawberry. The importance of the concerned microorganisms as public health hazards and recommendations for control has been highlighted.*

**Key words:** *Clostridium pelfringens E. coil- Salmonella species- Yersinia suedes ice - cream.*

## INTRODUCTION

Ice cream products are considered not only as a simple delicacy, but also as nutritional deserts containing dietary components that are important to both children and adults (*Varnam and Sutherland, 1994*). Frozen dairy products including ice cream are implicated as an important source of some pathogenic microorganisms constituting a serious threat to human health as public health surveillance reports documented that the number of ice cream related food poisoning outbreaks has steadily increased (*Ryser, 1998 and Vought and Tatini, 1998*).

*Bacillus cereus* is the causative agent of two distinct forms of gastroenteritis disease connected to food poisoning. The diarrheal syndrome which is characterized by abdominal pain and diarrhea, with an incubation period of 8 to 16 hours and symptoms that last 12 to 24 hours (*Elating-Schulz et al, 2004 and Lindback et al.,2004*) and the emetic syndrome is characterized by an acute attack of nausea and vomiting within 1-5 hours after a meal. The illness is relatively mild and recovery within 12-24 hours (*Kawamura et al., 2005 and Taylor et al., 2005*). *Bacillus cereus* has been reported as the causative agent in 1-22% of food poisoning outbreaks in Europe, Japan and North America over a period 1960-1992(*Pirhonen et al., 2005*).

Presence of *Clostridium perfringens* in food is considered as indicative of nature and soil contamination and incriminated in food poisoning outbreaks (*Hayes, 1992*). It is implicated in human food poisoning outbreaks traced to consumption of milk and its products. Food poisoning occurs as a result of ingestion of contaminated food with large population of the microorganisms and subsequent liberation of their enterotoxins in intestine (*Semedley et al., 2004*).

Many reports have been published earlier worldwide on the incidence of *Clostridium perfringens* in dairy products by several investigators (*Dalton et al., 2004; Fukao et al, 2004 and Nakamura et al, 2004*).

*Enteropathogenic Escherichia coli (EPEC)* has been implicated in human cases of gastroenteritis with symptoms of malaise, vomiting, diarrhea with stool containing mucous but rarely blood appear 12-36 hours after ingestion of food (*Adams and Moss, 2000*).

Contamination of food with *S.aureus* has been implicated in gastroenteritis in spite of advances achieved in dairy technology. Several outbreaks of staphylococcal food poisoning have been recorded, involving large number of people throughout the world (*Adams and Moss, 2000 and Holeckova et al., 2002*).

*Yersinia enterocolitica* is a zoonotic, Gram-negative bacterium capable of causing severe gastrointestinal infection (*Butler, 1998*). It produces a heat stable enterotoxin that is associated with food poisoning symptoms in man (*Quinn et al, 1994*). The predominant disease caused by pathogenic strains of *Yersinia enterocolitica* is enterocolitis, which accounts for two-thirds of reported cases especially in young children and characterized by fever and diarrhea, which frequently accompanied by abdominal pain lasting 1-3 weeks (*Marks, 1980*). Sometimes, *Yersinia enterocolitica* causes a syndrome which mimic appendicitis often in older children and young adults (*Lamps et al, 2001*).

Therefore, this work was accomplished to secure information regarding the incidence of some food poisoning organisms in ice cream products currently available at the retail level in Alexandria city.

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## MATERIAL AND METHOD

### 1. Collection of samples:

Sixty random samples of street-vended ice cream with chocolate, strawberry and vanilla flavor (20 each) were collected from street-vendors and hawkers in Alexandria city.

### 2. Preparation of samples:

The samples were left to melt in a thermostatically controlled water bath at 44°C for not more than 15 minutes. Each sample was then thoroughly mixed using a sterile stirrer before being examined. Eleven grams of each sample was diluted in 99 ml of peptone water 0.1% from which decimal dilutions were prepared (*APHA, 1992*).

### 3. Enumeration and isolation of *Bacillus cereus*:

It was performed by using direct plating using PEMBA agar. Suspected colonies were picked up for further confirmation according to *Kramer et al.,(1982)*.

### 4. Enumeration and isolation of *Clostridium perfringens*:

It was performed by using direct plating using Sulphite Polymyxin Sulfadiazine (SPS) agar as recommended by *Angelotti et al, (1962)*. Suspected colonies were picked up for further confirmation according to *Mead et al,(1981)*.

### 5. Enteropathogenic *Escherichia coli* count (*APHA, 1992*).

5.1. Serological identification of *E. coli* isolates (*Edward and Ewing, 1972*).

### 6. *Staphylococcus aureus* count (*I. C.M.S.F., 1986*).

### 7. Isolation and identification of *Versinia* species (*FDA, 1998*).

### 8. *Salmonella* species (*Cox, 1988*).

## RESULTS

**Table (1):** Incidence and counts of some food poisoning microorganisms in street-vended ice cream samples (n 60).

Flavor	Chocolate (n=20)		Strawberry (n=20)		Vanilla (n=20)	
	%	Mean ± SEM	%	Mean + SEM	%	Mean SEM
Bacillus cereus	20	$4.15 \times 10^3 \pm 1.1 \times 10^3$	25	$6.5 \times 10^3 \pm 2.4 \times 10^3$	15	$2.3 \times 10^3 \pm 0.33 \times 10^3$
<i>Cl.perfringens</i>	10	$1.1 \times 10^2 \pm 0.52 \times 10^2$	15	$2.15 \times 10^2 \pm 3.2 \times 10$	10	$7.5 \times 10 \pm 0.5 \times 10$
EPEC	20	$1.22 \times 10^4 \pm 0.4 \times 10^4$	25	$4.1 \times 10^4 \pm 0.54 \times 10^4$	15	$1.08 \times 10^4 \pm 6.3 \times 10^3$
S. aureus	30	$2.07 \times 10^3 \pm 1.07 \times 10^3$	25	$5.01 \times 10^3 \pm 1.43 \times 10^3$	20	$1.14 \times 10^3 \pm 0.4 \times 10^3$
<i>Y. enterocolitica</i>	0	-----	1	-----	0	-----
Salmonella	0	-----	0	-----	0	-----

SEM = Standard error of mean.

**Table (2):** Frequency distribution of EPEC serotypes isolated from positive street-vended ice cream samples.

Serotype	No.	%
O <sub>26</sub> : K <sub>60</sub> : B <sub>6</sub>	3	23.08
O <sub>86</sub> : K <sub>61</sub> : B <sub>7</sub>	2	15.38
O <sub>114</sub> : K <sub>90</sub> : B.	2	15.38
O <sub>119</sub> : K <sub>69</sub> : B <sub>14</sub>	1	7.69
O <sub>125</sub> : K <sub>70</sub> : B <sub>15</sub>	1	7.69
Untypable strains	4	30.77
<b>Total</b>	<b>13</b>	<b>100</b>

% The percentagy were estimated according to the total number of the isolates.

## DISCUSSION

Ice cream is the most popular frozen dairy product widely used all over the world due to its high nutritive value and its palatability to consumers at all ages. However, it is worth to mention that ice cream may constitute a serious public health hazard due to its contamination with a variety of pathogenic microorganisms which may gain entrance to ice cream through using inferior quality raw material, insufficient heat treatment of milk or contaminated equipment used for its preparation and distribution.

### 1. *Bacillus cereus*:

Data summarized in Table (1) showed that the majority of positive samples contaminated with *Bacillus cereus* were ice cream with strawberry flavor; lower counts were detected in ice cream with vanilla flavor. The obtained results indicated that ice cream could be responsible for transmitting *Bacillus cereus* to consumers. The presence of high number of *Bacillus cereus* organisms in a variety of food has been found to associate with the production of either emetic or diarrhogenic. extracellular protein heat labile, toxins (*Kawamura et al., 2005*).

It was suggested that food industry should be concerned with level as low as  $10^4$ /gm food because food toxic infection may be caused by ingestion of *Bacillus cereus* cells or spores which subsequently form enterotoxin in the ileum (*Granum et al., 1993*). Furthermore, *Becker et al., (1994)* recorded that 54% of infant food samples distributed in 17 countries were contaminated with diarrhogenic *Bacillus cereus* at level of 0.3-600/gm.

### 2. *Clostridium perfringens*:

It is worth to mention that, the probability of food borne illness may occur to children due to consumption of contaminated products with

anaerobes which is indicative of careless methods of production (**Bouer-Hertzberger, 1982**). Table (1) showed that *Clostridium perfringens* was detected in 10, 15, and 10% of examined ice cream with chocolate, strawberry and vanilla flavor, respectively.

### 3. Enteropathogenic *Escherichia coli*:

The data present in Table (1) showed that the mean counts of Enteropathogenic *Escherichia coli* (cfu/g) in the examined street-vended ice cream samples flavored with chocolate, strawberry and vanilla were  $1.22 \times 10^4 \pm 0.4 \times 10^4$ ,  $4.1 \times 10^4 \pm 0.54 \times 10^4$  and  $1.08 \times 10^4 \pm 6.3 \times 10^3$  with respective incidence of 20, 25 and 15%. The data present in Table (2) showed that the *E. coli* serotypes (O<sub>26</sub>:K<sub>60</sub>:B<sub>6</sub>), (O<sub>8</sub>:K<sub>61</sub>:B<sub>7</sub>) (O<sub>114</sub>:L<sub>90</sub>:B-) (O<sub>119</sub>:K<sub>69</sub>:B<sub>14</sub>) and (O<sub>125</sub>:K<sub>70</sub>:B<sub>15</sub>) were isolated from street-vended ice cream samples at incidence of 3 (23.08%), 2 (15.38%), 2 (15.38%), 1 (7.69%) and 1 (7.69%), respectively, while four isolates of *E. coli* proved to be untypable.

The public health hazard of *E. coli* organisms has been emphasized by several investigators as they have been implicated in human cases of gastroenteritis, epidemic diarrhoea in infants, sporadic diarrhoea in children as well as food poisoning (**DeBuyser et al., 2001**).

### 4. *Staphylococcus aureus*;

The presence of *S. aureus* in ice-cream may originate from skin, mouth or nose of workers handling the food. *S. aureus* is a good indicator of the personal hygiene of workers with respiratory infection and suppuration (**Kamat et al., 1991**).

Comparing the results with **Egyptian standards (1993)** which stipulated that ice cream must be free from *S. aureus*, it is clear that 30, 25, 20 % of examined street-vended ice cream samples with chocolate, strawberry and vanilla flavor did not comply with it, respectively.

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The growth of *S.aureus* in food products is a potential public health hazard since many strains can produce thermostable enterotoxins, which cause food poisoning, if ingested (*Erkmen, 1995*).

### 5. *Yersinia enterocolitica*:

*Yersinia enterocolitica* could be isolated from only one % of street-vended ice cream samples with strawberry. This result is lower than those reported by EI-Kholy (1992); **Khalil *et al.* (1993)**, **ilenin and Kaldas (1995)** and **EI-Sherbini *et al.* (1999)** with a rate of 6%, 8%, 8% and 26.25%, respectively. Serious cases may occur with rectal bleeding and perforation of the ileum (*Rabinovitz, 1987*). Moreover, there may be secondary immunologically mediated complications such as arthritis, erythema nodosum and to a lesser extent Reiter's syndrome, glomerulonephritis, myocarditis, exudative pharyngitis and septicaemia, which is less common and often reported in immunosuppressed individuals after contaminated blood products transfusion (*Strobel et al, 2001*). Salmonella failed to be detected in the examined samples of street-vended ice cream.

Although the results obtained showed lower contamination rates of pathogenic microorganisms in street-vended ice cream, it constitutes a high-risk hazard to consumers. The findings of the study warrant the need to undertake safety measures to avoid potential threats and apply educational programs for street-vended ice cream producers about the risk of contamination, how to prevent it and how to apply strict hygienic measures during production, storage and distribution of ice cream. Moreover, regulation of small-scale producing ice cream should be a part of a strategy to enhance producing of save and high quality ice cream in Alexandria city.



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بعض ميكروبات التسمم الغذائي في الأيس كريم المباع جانلياً في محافظة الإسكندرية

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يعتبر الأيس كريم من المتلجات اللبنية المحببة من الجميع وخاصة الأطفال, إلا أنه قد يشكل خطورة على صحة الإنسان مما قد يحمله من بعض الميكروبات المسببة للتسمم الغذائي لذلك فقط أجريت هذه الدراسة لمعرفة مدى تواجد بعض الميكروبات الممرضة في عدد ستون عينة من الأيس كريم المطعمة بالشيكولاتة والفرولة والفانيليا (20 عينة من كل نوع) والتي تم جمعهم بطريقة عشوائية من الباعة الجائلين بمدينة الإسكندرية وقد أسفرت النتائج عن تواجد ميكروب *Bacillus Cereus* بنسب

20 , 25 , 15% فى عينات الأيس كريم المطعمة بالشيكولاتة والفراولة والفانيليا على التوالي. بينما كان  
تواجد Clostridium Perfringens بنسب 10 , 15 , 100% على التوالي. أما ميكروب الإشيريكية  
القولونية فكانت نسبة تواجده فى العينات هى 20 , 25 , 15% على التوالي.  
كما أثبت النتائج أن 20 , 25 , 30% من العينات غير مطابقة للمواصفات القياسية المصرية  
بالنسبة إلى ميكروب المكور العنقودى الذهبى. كما تم عزل ميكروب اليارسينيا بنسبة 1% من عينات  
الأيس كريم المطعمة الفراولة. تم مناقشة النتائج وخطورة الميكروبات المسببة للتسمم الغذائى والمعزولة  
من العينات من الناحية الصحية والاقتصادية.