# Incidence of *salmonella* in Egyptian milk based desserts

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## A B S T R A C T

This experiment was conducted on a total of one hundred random samples of milk based desserts consists of rice pudding, mehallabia, custard and cream caramel, (25 samples each) were collected from different dairy shops and primitive restaurants in Minoufiya Governorate; transferred directly to the laboratory under strict hygienic conditions; for the detection, isolation and identification of Salmonellae. The percentage of *Salmonella* in the examined samples of mehallabia was 8%, while not detected for the examined rice pudding, custard and cream caramel samples. The isolated *Salmonella* serovars from mehallabia samples were *Salmonella enteritidis* and *Salmonella typhimurium*. The current result indicated that the mehallabia samples represent a source of foodborne disease for human being.

**Key Words: Rice pudding; Mehallabia; Custard; Cream caramel; *Salmonella*; Serovars.**

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## 1. INTRODUCTION

Over the past few years, food safety has become very topical subject, eliciting a great deal of public concern elsewhere. As, certain food and their products particularly become contaminated with different microorganisms, likewise, milk –based desserts which are the most palatable, nutritious, healthful and relatively inexpensive dairy food. These milk based desserts are popular dairy food usually prepared from ingredients that the milk is the base constituent, these types of desserts consumed in Egypt by a wide range of people of all ages and are usually served cooled (Al-Gendi, 2004). Typical dairy desserts are junket, custards, trifles, soufflés, cream caramel, often with other ingredients such as fruits, nuts, cereal foods, starch, gelatin, and all based on milk, skim milk and/or cream. The dairy desserts would include ice-creams and fruit yoghurts (Davis, 1981). Mehallabia and rice with milk are almost consumed in our country, Egypt, by a wide range of people of all ages (EL-shaar, 1993). Poor personal hygiene causes more than 90% of the sanitation problems in food service industry. Also government statistics showed that improper hand washing alone accounts for more than 25% of all food borne illnesses (Weistein, 1991). The important bacteria causing food poisoning include *E.coli* and *Salmonella* (Jay, 1992). *Salmonella* species are found worldwide and are universally recognized as zoonotic agents. Many foods particularly of animal origin and those subjected to sewage pollution, had been identified and must be taken into consideration as a vehicle for transmitting these pathogens to human being. The primary habitat of *Salmonella* species is the intestinal tract of animals and humans. Milk is considered as an important vehicle for *Salmonella* causing human infection. Additionally *Salmonella*

species causes illness by means of infection, as they multiply in the small intestine, colonizing and subsequently invading the intestinal tissues, producing an enterotoxin and causing inflammatory reaction and diarrhea (ICMSF, 2006). The symptoms of salmonellosis include diarrhea, nausea, vomiting, fever and abdominal cramps (Cui, 2004). *Salmonella* is the second most common of food borne illness. It is responsible for millions of cases of food borne illness a year (HGIC, 2000).

Milk-based products are good media for microbial growth due to high nutrient value, almost neutral pH value (pH 6-7) and long storage duration (Bell and Kyriakides, 1998). Therefore, the aim of the present study was to throw light on the incidence, isolation and identification of *Salmonella* from some milk based desserts.

## 2. MATERIALS AND METHOD

### *2.1. Collection of samples*

A total of one hundred random samples of rice pudding, mehallabia, custard and cream caramel (25 samples of each), were collected from different supermarkets at Minoufiya Governorate. Mehallabia consisted of starch, milk, sugar and vanilla, while rice pudding ingredients are milk, sugar, rice and other additives such as vanilla, raisins and shaved coconut to enhance its nutritive value and improve its flavor (El-Sharr, 1993). While caramel or caramel custard is a custard dessert with a layer of soft caramel on top Cream caramel ingredients are milk, sugar ,heavy cream, egg yolk and vanilla .custard is a mixture of milk or cream and egg yolk, sugar, vanilla and corn starch (Troller, 1979). The collected samples were transferred directly to the laboratory in an ice box under complete aseptic conditions. The samples were immediately examined bacteriologically for the detection of *Salmonella.*

### *2.2. Preparation of samples*

The samples were prepared according to the technique recommended by APHA (1992) as follow**:** Twenty five grams of the examined samples of dairy desserts were transferred to aseptic blender jar and 225 ml of 0.1% sterile buffered peptone water were aseptically added to the content of jar. Each sample was then homogenized in the blender at 2000 rpm for 1-2 minutes to provide a homogenate.

### *2.3. Isolation and identification of Salmonella*

The techniques adopted were carried out according to APHA (2003).

#### *2.3.1. Pre-enrichment*

Twenty five ml of prepared milk based desserts samples into a sterile 500 ml Erlenmeyer flask followed by addition of 225 ml of lactose broth. Swirl thoroughly by hand and let to stand for 60 minutes at room temperature. Mix well by swirling and incubated for at 35 ºC 24 ± 2 hours.

#### *2.3.2. selective enrichment*

One ml of mixture was transferred to 10 ml. Rappaport Vassiliadis broth and incubated at 35 ºC for 24 ± 2 hours.

#### *2.3.3. Plating on selective media*

A loopful of incubated Rappaport Vassiliadis broth was sub cultured into the surface of xylose lysine desoxycholate (XLD) followed by incubation at 35°C for 24 hours.

### *2.4. Identification of the isolates according to APHA, 2003.*

#### *2.4.1. Microscopical examination*

Films were made from the pure culture of isolated organisms stained by Grams stain and examined microscopically. Gram negative non spore forming rods were considered as positive salmonella.

#### *2.4.2. Motility test*

*Salmonella* showed positive reaction through spreading growth around stabbing line.

#### *2.4.3. Biochemical tests*

Indol test, Methyl Red Test, Voges Proskaur test, Citrate utilization test, Sugar fermentation and Lysine Decarboxylase broth were used as biochemical tests to identify the isolated strains (Cheesbrough, 1985; Mac Faddin, 2000).

*2.4.4. Serological identification*

Isolates proved biochemically to be *Salmonella* microorganisms were subjected to serological identification, according to the Kauffman- white scheme (Kauffman, 1974) for the determination of somatic (O) and flagellar (H) antigens using *Salmonella* antiserum (Denka Seiken Co., Japan). Separate O anti sera were applied to determine the group of the *Salmonella* isolates. Polyvalent H anti sera for both phase 1 and phase 2 were tried in order to determine the complete antigenic formula of the isolates.

## 3. RESULTS

Despite of the traditional food hygiene efforts for reduction of agents responsible for food borne illness, *Salmonella* remains as one of the major food borne health hazards. Milk plays an important role, as a reservoir, in disseminating *Salmonellae*. In the present study a total of one hundred random samples of milk-based desserts (rice pudding, mehallabia, custard and cream caramel; 25each) were examined for *Salmonella*.

*3.1. Incidence of salmonella in the examined samples of dairy desserts.*

Table 1 revealed that the incidences of *Salmonella* in the examined samples of milk-based desserts was 8% for the examined mehallabia samples, while not detected in the other samples. *Salmonella* could be isolated from only two samples of mehallabia samples.

*3.2. Antigenic structure of Salmonella isolated from the examined samples of different dairy desserts.*

Data in Table (2) revealed that the serologically identified *Salmonella* isolates in the examined samples of mehallabia were two, *Salmonella enteritidis* and *Salmonella typhimurium.*

Table (1): Incidence of *Salmonella* in the examined samples of milk based desserts.

| Examined samples | Number of samples | Positive samples | |
|---|---|---|---|
| | | Number | % |
| Rice pudding | 25 | ND | ND |
| Mehallabia | 25 | 2 | 8% |
| Custard | 25 | ND | ND |
| Cream caramel | 25 | ND | ND |

Table (2): Antigenic structure of *Salmonella* isolated from the examined samples of milk based desserts.

| Examined samples | *Salmonella* serotypes | Antigenic structure | | |
|---|---|---|---|---|
| | | O | H | |
| | | | Phase 1 | Phase 2 |
| Mehallabia | *Salmonella enteritidis* | 1,9,12 | g,m | 1,7 |
| | *Salmonella typhimurium* | 1,4,5,12 | i | 1,2 |

## 4. DISCUSSION

Nabbut (1993) discussed the acute gastroenteritis which represents the public health problem in all countries. Many bacteria including *Salmonella* have been implicated as etiological agent of gastroenteritis. Ingestion of sufficient amounts of contaminated food or water containing enough *Salmonella* can result in sporadic cases of outbreaks of acute gastroenteritis. *Salmonella* have been considered to be the most important causal agents of foodborne illness throughout the world since the first laboratory confirmed outbreak of salmonellosis in 1988. Hundreds of outbreaks still occur in most countries every year (Bell and Kyriakides, 2002). The result obtained from this study indicated that incidence of *Salmonella* in the examined mehallabia samples were 8% and this result nearly similar to those recorded by Albrech (2014) who reported that Salmonella food poisoning usually associated with cream filled desserts. Contamination of mehallabia samples with Salmonella indicates poor personal hygiene during food handling, processing, storage and inadequate refrigeration. Proliferation of this organism in foods may result from handling cooked foods by workers who are carriers of Salmonella (Abdel-Fattah, 2014). The current results revealed that Salmonella failed to be detected in any of the examined rice pudding, custard and cream caramel samples and this may be attributed to the exposure to high temperature during processing and cooking procedures. These results are nearly similar to those recorded by Nassib et al. (2003) who stated that the randomly collected samples of dairy products and milk most of them were free from Salmonella. Moreover, Millard (1999) revealed that the microbiological status of 72 samples of un-refrigerated desserts (stored at room temperature) were free from *Salmonella.*

Data in Table (2) showed that the two serologically identified *Salmonella* isolates in the examined samples of mehallabia were *Salmonella enteritidis* and *Salmonella typhimurium.* Historically, *S. typhimurium* is the most frequently serovars and *S. enteritidis* is the second as causative agents of human gastroenteritis throughout the world and were isolated from cases of food poisoning and represents about 50-60 of the cases (Sharma et al., 1996). Thus, *S. typhimurium* was the commonest serovars colonize udder and be shed in milk in high level (Weber et al., 2000). *S. enteritidis* was reported as the most commonly serotype of *Salmonella* causing disease in human. (Taylor et al., 1974).

Among the major food-borne illnesses, salmonellosis has received the most attention. The disease is considered as one of the most important zoonotic diseases in which the main sources of infection is food of animal origin and the mortality due to salmonellosis is relatively

low and occurs only in very old individuals and infants (Roy et al., 2002).

## 5. CONCLUSION

Mehallabia, as a milk based dessert, would be an important source of pathogenic *Salmonella* due to insufficient heat treatment of milk during preparation of this product and the lack of hygienic knowledge of food handlers. Therefore exposure of milk to sufficient heat treatment, food handlers should have the necessary knowledge and skills to enable them to handle food hygienically and worker's hands come in contact with raw materials should be thoroughly washed and sanitized these factors tremendously decrease the incidence of *Salmonella* in milk-based desserts. In addition, workers should have medical certificate to avoid cross contamination.

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## مدى تواجد ميكروب السالمونيلا في بعض الحلويات اللبنية المصرية

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## الملخص العربي

أجريت هذه الدراسة على 100 عينة من الأرز باللبن، المهلبية، الكاسترد والكريم كراميل (25 عينة من كل نوع) من بعض محلات الألبان المختلفة بمحافظة المنوفية. وقد تم إرسال هذه العينات على وجه السرعة وتحت ظروف صحية إلى المعمل. وتم تحضير العينات لفحصها بكتريولوجياً والتعرف على المعزولات كالاتي: تم وزن 25 جرام من عينات الحلوي اللبنيه وتم وضعها في برطمان معقم ثم اضافة 225مللي من 1% ماء ببتون متعادل معقم وتم خلط المحتويات عند سرعه 2000 لفه لمده 1-2 دقيقة للحصول على خليط متجانس وقد أوضحت الدراسة النتائج التالية: لم يتم عزل ميكروب السالمونيلا من عينات الأرز باللبن، الكاسترد والكريم كراميل. بينما كانت نسبة ميكروب السالمونيلا في عينات المهلبية (8%) وكانت العترات المعزولة هي سالمونيلا تيفيميوريم وسالمونيلا انترتيدس. مما سبق يتضح أن المهلبية كحلوى لبنيه، ستكون مصدرا هاما من مصادر السالمونيلا المسببة للأمراض بسبب عدم كفاية المعالجة الحرارية للحليب أثناء التحضير لهذا المنتج وكذلك عدم معرفه متداولي الأغذية المهارات اللازمة لتمكينهم من التعامل الصحي مع الغذاء. ولذلك توصي الدراسه بضرورة معالجة الحليب حراريا"" بدرجه كافية، كما ينبغي أن يكون لدي متداولي الأغذية المعارف والمهارات اللازمة لتمكينهم من التعامل مع الغذاء صحيا. كما ينبغي أن يكون للعمال شهادة طبية لتجنب التلوث المتبادل. هذه العوامل تقلل بشكل كبير من انتشار السالمونيلا في الحلوى اللبنية.

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