

## Evaluation of Contamination of Confectionary Cream by *E. coli* in Mazandaran Cities

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**Abstract:** To evaluate the safety quality of confectionary creams, 180 samples were collected from four different areas of Mazandaran city's (Amol, Behshahr, Tonekabon and Gaemshahr). 91.66% of the samples contained coliforms ( $>10\text{CFU/gm}$ ), while 88.88% of the samples were contaminated by *E. coli* and the average *E. coli* number in the samples was  $2.74 \times 10^4$  per gram of confectionary cream. The results of this study showed that the contamination of confectionary creams by coliforms and *E. coli* in the different areas of Mazandaran cities. (Amol, Behshahr, Tonekabon and Gaemshahr) were almost the same.

**Key words:** *E. coli* · Confectionary Cream · Coliform · Mazandaran

### INTRODUCTION

The common location for the coliforms natural life is the intestine or the soil and water. Among different kinds of coliforms, *E. coli* is considered as an indicator microorganism that lives in humans and livestock intestine in a symbiotic or pathogenic form and is the most important factor in causing urinary tube infection for the infants, meningitis and others. So the existence of these bacteria in water and food is prohibited in national and international standards and having *E. coli* in food would explain the fact that other bacterial microorganisms intestinal or excremental may exist in food, which are mostly pathogenic [1-6].

Thus, because in the case of food quality control the coliforms one by one evaluation is not possible, *E. coli* serves as a representative or the indicator of the intestinal microorganisms in the hygienic food control and milk and dairy products due to their ease of contamination are the sources of the most important food diseases. The confectionary cream is composed of milk and other components each of which may contain different pathogenic and non-pathogenic microorganisms [2-5].

### MATERIALS AND METHODS

**Samples:** The study was conducted within 9 months in spring, summer and autumn 2011 and 180 samples of

confectionary cream from different cities of Amol, Behshahr, Tonekabon and Ghaemshahr were collected. For each season a number of samples from the given cities were collected and put in sterile container in ice boxes and carried to the Dr. Shohre Quality Control laboratory in Amol to be studied and analyzed (the samples were kept in the refrigerator before the experiment).

**Methods:** The culture methods, counting the coliforms, verifying and identifying *E. coli* were conducted based on the standard instructions and guidelines provided with Industrial Standard and Research Institute of Iran [5-7]. Twenty-five gm of each sample was taken after mixing and then 1/10 serial dilutions were prepared. Then, the dilutions of  $10^{-1}$ ,  $10^{-2}$ ,  $10^{-3}$  and  $10^{-4}$  of the confectionary cream were cultured in VRBA (Violet Red Bile Agar) by Pour-Plate method [2] and then were incubated for 24 to 48 h at  $37^\circ\text{C}$  for the possible growth of the coliforms. After counting the colonies, at least five grown colonies were selected and then they were transferred into BGGBLB tubes (Brilliant Green Bile Lactose Broth), mixed and incubated for 24 to 48 h at the  $37^\circ\text{C}$ . When gas was gathered in the tube and made it opaque, then the coliforms were verified. Then the from these tubes 1 ml was added to other BGGBLB pipes and 1 ml to pipes containing the petunia water and the pipes were incubated for 24 to 48 h at  $44^\circ\text{C}$  temperature. One ml of Erlich-Coax was added to the petunia water condition with

Andale, a dark red color would be produced immediately, or after a slow shaking, which would gather at the top of the pipe.

Finally, the evaluation and statistical analysis on the contamination rate of cream samples of different cities were performed using SPSS (version 10) software.

## RESULTS AND DISCUSSION

In this study, 180 samples of the confectionary creams existing in different confectionary shops were collected from the cities of Amol, Behshahr, Tonekabon and Ghaemshahr which were analyzed and evaluated in a laboratory using methodologies in identifying, counting and measuring *E. coli* in food based on the standard instructions and guidelines provided with Industrial Standard and Research Institute of Iran. From the 180 samples 91.66% contained coliforms bacteria more than the permissible range (>10 bacteria/gram). The *E. coli* bacterium was separated from 160 samples (88.88%) out of the total samples (Table 1). The percentages of the samples contaminated with *E. coli* in spring, summer and autumn were 85, 95 and 86.66%, respectively and those of the samples contaminated with coliforms in spring, summer and autumn were 90, 96.66 and 88.33%, respectively (Table 2).

The evaluation and analysis of the contamination with *E. coli* as the indicator of the coliforms based on the standard guidelines were approved systematically which is considered as an essential factor to comply with the relevant regulations of product quality in standardizing the food with regard to the health values [1, 8]. There are several reports of the incidence of diseases and food poisoning caused by the microbial contamination of the food in different places in the world [3] including bloody diarrhea and bleeding in the colon caused by *E. coli* in 1986 in 46 patients in Canada who were infected by drinking raw milk and also 17 cases of patients were infected by drinking pasteurized contaminated milk [9].

Many of these diseases happened due to the consumption of imported contaminated food or being contaminated during transportation and storage such as the imported cheeses from France to America in 1973 AD, which caused gastroenteritis epidemic in consumers [4].

There are also numerous reports of the malfunctioning water treatment centers resulting in contaminated drinking water with waste water and as a result infected the food from the food factories [10] among which the contaminated cheese and cream produced in

France in 1983, the contamination of the packed up red and white meat in America in 1985 and the burgers contamination produced in the Ontario state of Canada in 1991 with *E. coli* can be mentioned which caused diseases and mortalities [9]. There are also some reports in Iran, which shed lights on the gastroenteritis in several cases, which are due to ignoring the health values at the time of production, food preparation and food storage in inappropriate circumstances to await [6-9].

As it is shown in Table 1, the amount of confectionary cream contaminated with coliforms and *E. coli* in the cities of Amol, Behshahr, Tonekabon and Ghaemshahr were nearly the same and in all cases it exceeded the standard level, but there were not any significant differences between the samples in the different cities. Based on some studies on creamy sweets, 95% of the samples were contaminated with coliforms and 88.75 with *E. coli*. Scott and Bloomfield [11] reported that microorganisms infecting the surfaces and containers would live between 4 and 24 hours and if these areas are wet and have humidity, their life span increases.

Poor health issues of the workers and staffs involved in providing the material and ignoring to wash the hands or using detergents when washing and touching the mouth and nose during food preparation stage are the most important factors, which play important roles in transferring *E. coli* or *Staphylococcus aureus* bacteria [2, 11].

Although the hygienic values are not high in an area and the transfer of the microorganisms from the contaminated food will increase the acquired health immunity against the microorganisms, the children, elderly and those suffering from the weak immune system are more vulnerable to the outbreak of the disease related to the microorganisms. Besides, the tourists due to the lack of previous exposure to microbial strains in the food and acquired high resistance of these strains are more sensitive to the incidence of food poisoning and infections [12-15].

Considering the fact that the standards in every community follow the hygienic factors of that community and the creamy sweets are not following the standards and don't have the desired quality, we should try to do our best to increase the quality of these kind of sweets to be matched with that of the standards in order to fulfill such objectives, it seems that the initial cream mixture pasteurization or appropriate heating to control the contamination at early stages. Also increasing the producers' culture status in maintaining the hygienic

Table 1: The amount of confectionary cream contamination by coliforms and *E. coli* based on their number and non-standard condition in the cities of Amol, Behshahr, Tonekabon and Ghaemshahr

Cities	Amol			Behshahr			Tonekabon			Ghaemshahr			Total		
The standard amount of Bactria per Gram	Sample size (number)	Identified number	Percentage	Sample size (number)	Identified number	Percentage	Sample size (number)	Identified number	Percentage	Sample size (number)	Identified number	Percentage	Sample size (number)	Identified number	Percentage
Coliform<10	45	42	93.33	45	43	95.55	45	40	88.88	45	40	88.88	180	165	91.66
<i>E. coli</i> =0	45	41	91.11	45	42	93.33	45	39	86.66	45	38	84.44	180	160	88.88

Table 2: The amount of confectionary cream contamination by coliforms and *E. coli* based on their number and non-standard condition in the different seasons

Cities	The standard amount of Bactria per Gram	Spring			Summer			Autumn			Total		
		Sample size	Non-standard cases	Percentage	Sample size	Non-standard cases	Percentage	Sample size	Non-standard cases	Percentage	Sample size	Non-standard cases	Percentage
Amol	Coliforms<10	15	14	93.33	15	15	100	15	13	86.66	45	42	93.33
	<i>E. coli</i> =0	15	13	86.66	15	15	100	15	13	86.66	45	41	91.11
Behshahr	Coliforms<10	15	14	93.33	15	15	100	15	14	93.33	45	43	95.55
	<i>E. coli</i> =0	15	14	93.33	15	14	93.33	15	14	93.33	45	42	93.33
Tonekabon	Coliforms<10	15	13	86.66	15	14	93.33	15	13	86.66	45	40	88.88
	<i>E. coli</i> =0	15	13	86.66	15	14	93.33	15	12	80	45	39	86.66
Ghaemshahr	Coliforms<10	15	13	86.66	15	14	93.33	15	13	86.66	45	40	88.88
	<i>E. coli</i> =0	15	11	73.33	15	14	93.33	15	13	86.66	45	38	84.44
Total	Coliforms	60	54	90	60	58	96.66	60	53	88.33	60		
	<i>E. coli</i>	60	51	85	60	57	95	60	52	86.66	60		

values in all the stages of production and distribution to reduce the second kind contamination outbreak can be categorized as the steps to increase the sanitation level of these products. This product is health-enhancing level [13-19].

**ACKNOWLEDGEMENT**

In the end, we would like to express our thanks to Mr. Babak Hassanzadeh who helped us in writing and editing the article.

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