Int.J.Curr.Microbiol.App.Sci (2020) *9*(12): 2236-2240

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 12 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.912.263

Bacteriological Evaluation of Locally Marketed Ice Cream in Navsari City of Gujarat

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Keywords

Ice cream, *Staphylococcus aureus, E. coli*

Article Info

Accepted:
16 November 2020
Available Online:
10 December 2020

A B S T R A C T

The present investigation was carried out to study the bacteriological quality of locally manufactured ice cream in Navsari city of Gujarat. A total of 150 samples were collected aseptically from local vendors situated in different locations of the city. The attempts were made to detect three species of bacteria namely *Staphylococcus aureus*, *Escherichia coli* and *Salmonella* spp. The organisms were isolated using standard laboratory methods and confirmation was done by Gram's staining and various biochemical tests. *Salmonella* spp. was not detected in any of the samples, however 17 samples contained *E. coli* and *Staphylococcus aureus* was present in 69 samples.

Introduction

Ice cream is a popular frozen dessert consumed by people of all age groups. In addition to milk, it contains a variety of ingredients like fresh and dry fruits, jelly, colours and flavours (Naim *et al.*, 2014). The ingredients may serve as source of various microorganisms and will eventually affect the quality of ice cream.

The high percentage of lactose and proteins in ice cream, as well as the neutral pH, make it a good growth medium for many microorganisms that eventually cause diseases in the consumers, such as cholera, typhoid and chronic intestinal diarrhea (Jabuk *et al.*, 2019). Growth and multiplication of various bacteria may take place during production, packaging, storage and distribution of the product. Psychrotrophic bacteria like *Listeria monocytogens, Staphylococcus aureus, Bacillus* spp., *Salmonella* spp., *Shigella*, *Streptococcus* spp., *Psedudomonas* spp. have been recovered from dairy food products (Das *et al.*, 2020). This study was conducted to assess the microbiological quality of locally produced ice cream sold in Navsari city

Materials and Methods

A total 150 samples (as mentioned in Table 1) were collected in sterile collection tubes from different locations of Navsari city and analyzed at the department of Veterinary Public Health and Epidemiology, College of Veterinary Science & Animal Husbandry, Navsari.

Isolation of *Salmonella* spp.

For isolation of *Salmonella* spp., pre-enrichment of 25 g sample was done in 225ml of 10% buffered peptone water at 37°C for 24 hours followed by selective enrichment of 0.1 ml pre-enriched sample in 10 ml Rappaport-Vassiliad is Soy Broth at 37°C for 24 hours and finally plating of inoculum from enrichment media on Xylose Lysine Deoxycholate (XLD) agar incubated at 37°C for 24 hours.

Isolation of *E. coli* and *Staphylococcus aureus*

For Isolation of *E. Coli* and *Staphylococcus aureus* enrichment of 25 g sample was done in 225ml of 1% buffered peptone water at 37^0C for 24 hours followed by plating on Eosin Methylene Blue (EMB) agar for *E. Coli* and on Baird Parker agar (BPA) for *Staphylococcus aureus*, respectively, and incubation of the plates at 37^0C for 24-48 hours.

For identification of the isolates, Gram's staining and biochemical tests like Indole, MR VP, Nitrate, Citrate, Catalase, Urease, TSI were conducted using standard laboratory methods.

Results and Discussion

Out of 150 samples examined during the study, *Salmonella* spp. was not detected in any of the samples. Similar findings were recorded by Maifreni *et al.,* 1993; Kivanc *et al.,* 1994; Warke *et al.,* 2000 and Kanbakan *et al.,* 2004.

Staphylococcus aureus was detected in 69 (46%) samples collected from various locations as mentioned in Table 1. Higher contamination rates of 62.3 % and 100 %, at the counts above the safe limit level were also reported by Kivanc *et al.,* (1994) and Warke*et al.,* (2000). In the city of Kolhapur, Jadav*et al.,* (2004) observed that 40 % ice cream samples were positive for *Staphylococcus* spp. most of them were purchased from road vendors. A total 22 (22%) *Staphylococcus aureus* isolates were detected from 100 samples of ice cream by Samir *et al.,* (2018) in Egypt and nearly similar isolation rates for *Staphylococcus aureus* were observed in the studies conducted by Kamal *et al.,* (2009) at 22.9%, Moshood *et al.,* (2013) at 20% and Tawab *et al.,* (2016) at 26%. The presence of *Staph.aureus* may be due to glitch in the process of pasteurization or human exposure. In humans, *Staph.aureus* inhabits the skin-arms, hands, and face being the main sources, nasal cavity, eyes, throat and intestinal tract. From these sources, the organism finds its way into air, dust and fomites from which it may contaminate foods Normanno *et al.,* (2007). Contamination also indicates inadequate personal hygiene of workers during manufacturing and vendors selling the ice cream.

Escherichia coli was detected in 17 (11.33%) samples, as shown in Table 1. *E. coli* was detected in 15 out of 73 (20.55%) ice cream samples (Yaman *et al.,* 2006). In studies conducted on ice cream samples in Turkey, incidence rates of 22 % and 3.33 % were reported by Kivanc *et al.,* (1994) and Erol *et al.,* (1998) in different cities. Masud (1989) reported *E. coli* in 23 out of 50 samples (46 %) analyzed. Anenteric pathogen, *E. coli,* in

samples indicates faecal contamination of water used during preparation of the product or for cleaning of the equipments and utensils. Also it is an indicator of workers not following basic self-hygiene practices during production.

Table.1 Samples collected from different areas of Navsari city

Area of collection	Number of samples	Samples positive for *E. coli*	Samples positive for *Staphylococcus aureus*
Navsari railway station	10	10	10
Gopal Nagar	12	------	12
Eru char rasta	8	6	8
Sandkuwa	4	------	------
Fuwara	12	------	------
ShivajiChowk	12	------	------
Tower	8	------	------
Market	12	------	------
Jamalpore	4	------	------
Bus Depot + Nearby area	12	------	12
Circuit House	4	------	------
Station Road	4	1	4
Jalalpore	8	------	8
Lunsikui	12	------	8
Grid road	12	------	5
Veravalnaka	8	------	1
Zaveri Road	8	------	1
TOTAL	**150**	**17 (11.33%)**	**69 (46%)**

In conclusion the ice- cream is a favorite food to many but if not correctly manufactured, stored and handled it can become a source of infection. Ice creams manufactured in domestic premises is more prone to contamination and thus may act as vehicle for gastrointestinal diseases. From the current findings it could be opined that *E. coli* and *Staph. Aureus* may become a cause of food borne illness due to consumption of such ice cream. The quality of raw milk used, raw materials like sugar, nuts or fruit added to the ice cream, maintaining cod-chain during storage and transportation of the final product, and handling of the product by vendors at the point of sale as well as personal hygiene are critical steps in preventing the growth of undesirable microorganisms. It is observed that habits like washing of hands before handling the product, frequent cleaning of scoops used for dispensing the ice-cream, maintaining cleanliness of surfaces in the shop are not very strictly practiced by the vendors. Also, in shops where a constant inflow of customers is expected and those located in busy and crowded areas are more likely to be contaminated due to frequent opening and handling of the containers. Therefore, it is essential for local vendors to adopt good manufacturing practices as well as hygienic distribution and storage practices for ensuring microbiological safety of ice cream sold to customers.

Acknowledgement

The authors are grateful to acknowledge the support rendered by the Dean, Veterinary College and Director of Research & Dean, PGS, Navsari Agricultural University, Navsari, Gujarat, India by providing necessary facilities and resources to write this research article.

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How to cite this article:

Deepti N. Nayak, J. B. Solanki, C. V. Savalia and Pushpa Makwana. 2020. Bacteriological Evaluation of Locally Marketed Ice Cream in Navsari City of Gujarat. *Int.J.Curr.Microbiol.App.Sci.* 9(12): 2236-2240. doi: https://doi.org/10.20546/ijcmas.2020.912.263