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

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ABSTRACT

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.

Keywords
Ice cream, Staphylococcus aureus, E. coli

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 monocytogenes, 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 370°C 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 370°C for 24-48 hours.

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                | ------                         | ----                                       |
| Shivaji Chowk                 | 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.
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