



DETECTION OF PATHOGENS IN ICECREAMS PRODUCED BY LARGE-SCALE MANUFACTURERS IN MUMBAI CITY.

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ABSTRACT

A study of the microbial quality of ice cream serves to indicate whether or not manufacturers employ proper sanitary procedures in the preparation of these products and the potential risk of acquiring food borne pathogens on their consumption. The present study was undertaken to assess if the bacteriological quality of ice creams sold by five large-scale manufacturers in Mumbai city conformed to microbial standards and were free of pathogenic bacteria. Tests were carried out for the detection of Staphylococci, E.coli, Pseudomonas, Shigella and Salmonella. While most of the ice cream samples produced by four manufacturers showed presence of these organisms, only one of the commercially available brand of ice cream conformed to the accepted standards. E.coli, a faecal coliform was found to be the most common pathogen present.

KEYWORDS : Ice cream, *Staphylococcus aureus*, E.coli, Shigella, Mumbai.

INTRODUCTION

Ice cream is undoubtedly one of the most popular and favorite food products in Mumbai among children and adults especially during summer season. Several brands of ice cream in a variety of flavors are marketed here. Quality of ice cream depends on many intrinsic and extrinsic factors. Possible sources of microorganisms in ice creams have been reported to include raw materials used for the composition of ice cream-mix, such as milk and milk powder, cream, flavouring and colouring substances and sanitizer (Verma, 1972; Bathla and Rao, 1973) and from contaminated air during processing (Gomez, 1969). Processes applied during its production are thought to prevent and eliminate most of the microbiological hazards associated with its consumption. Pasteurization is most commonly applied heat treatment in the dairy industry which can destroy most pathogenic bacteria in the milk used for the preparation of ice cream. The subsequent processes that subject the mixtures to freezing temperature inhibit the growth of any remaining flora. Also, as automatic machines are used for making ice-cream in dairy industry, the chance of contamination through direct hand manipulation is also drastically reduced.

However, a milk-based product, ice cream is a good medium for microbial growth due to its high nutrient value, near neutral pH value and long periods of storage (Bell, C. et al,1998). Numerous health hazards are persistent due to reasons like contamination during the product handling as well as unsanitary conditions observed during frozen storage. Many psychrophiles and psychrotolerant spoilage microorganisms (*Bacillus*, *Micrococcus*, *Pseudomonas*) and pathogens like *Streptococcus*, *Staphylococcus aureus*, *Salmonella*, *Shigella*, *Listeria*, *Campylobacter* and *Brucella* are generally present in ice cream. (JayJM, 1992). Many food poisoning cases are associated with the consumption of such contaminated products. Therefore, it is necessary to ascertain whether the ice-cream produced and distributed is hygienically safe, without any public health hazard. The present study was designed to determine the microbial quality of ice cream produced and sold by five large scale manufacturers in Mumbai city, and assess the potential risk to public health.

MATERIALS AND METHODS

Sample Collection:

A total of 20 different samples of ice-creams were collected for this study. 5 different brands produced by large-scale

manufacturers in Mumbai were bought from the local market.

All samples were transported in an insulated container packed in ice and brought to the laboratory within half an hour and tested immediately for microbial quality.

Preparation of sample for analysis:

Prior to analysis, ice creams were kept in water bath at 45°C for 5 min. After thawing, 1gm of liquid ice cream was transferred into a sterile tube. 10⁻¹ dilution of the melted ice cream sample was made using sterile 0.1% peptone water and used for the detection of various pathogenic microbes by the following tests:

Detection of *Staphylococci*: 0.1 ml aliquot of the diluted ice cream was spread on sterile salt mannitol agar (SMA) and incubated at 37°C for 24 hours. Yellow colonies were Gram stained and checked for production of coagulase and catalase enzyme.

Detection of *E.coli*: 0.1 ml aliquot of the diluted ice cream was spread on sterile Mac Conkey's agar and incubated at 37°C for 24 hours. Pink colored colonies were Gram stained and checked for production of Indole using tryptone water. (Salle, A.J.,1984). Colonies were also inoculated in triple sugar iron medium (TSI) (Salle, A.J.,1984).

Detection of *Pseudomonas*: 0.1 ml aliquot of the diluted ice cream was spread on sterile cetrimide agar and incubated at 37°C for 24 hours. Colonies were Gram stained.

Detection of *Shigella* and *Salmonella*: 0.1 ml aliquot of the diluted ice cream was spread on salmonella shigella agar and incubated at 37°C for 24 hours. Colorless non-lactose fermenting colonies were Gram stained, checked for motility and inoculated in TSI medium.

Results were compared with the requirements given in the specifications as per BIS (IS:2804 – 1964). (Indian Standards 2002). According to these regulations, any frozen confection for sale should not contain any pathogens. Salmonella and other pathogens should be ABSENT.

RESULTS

The results obtained on performing bacteriological tests to detect pathogens are depicted in Table 1

Table 1: Presence of pathogenic bacteria in five popular commercially available ice cream brands.

Ice cream brands	Staphylococci	E.coli	Pseudomonas	Shigella
K	-	-	-	-
A	+	+	-	-
M	+	+	+	+
C	-	+	+	-
H	+	+	+	-

- Absent
+ Present

Bacteriological examination revealed that only one of the brands 'K', did not show presence of any pathogens.

Table 2: Percentage of samples of each brand of ice cream that tested positive for pathogens

Ice cream brands	Staph.	E.coli	Pseudomonas	Shig.
K	Nil	Nil	Nil	Nil
A	50%	50%	Nil	Nil
M	25%	25%	25%	25%
C	Nil	100%	25%	Nil
H	25%	75%	25%	Nil

The order of prevalence of pathogens in samples tested could be given as:

E.coli > *S.aureus* > *Pseudomonas* > *Shigella*
E.coli, being the most common pathogen, indicates the high risk of diarrhoea on consumption of these ice-creams.

DISCUSSION

In the current study, the microbiological surveillance findings revealed that four out of five ice cream brands collected during January 2020 from Mumbai city showed the presence of pathogenic organisms and were found to be unsatisfactory and unfit for consumption.

This may indicate the bad quality of ingredients such as flavors, coloring agents and fruits which are added to the mix after pasteurization or air incorporation. The quality of ice-cream also suffers when stored for extended periods (James M., 1978).

The presence of *shigella* and coliforms like *E.coli* indicates possible faecal contamination. This suggests the possibility of other intestinal pathogens of also being present, though salmonella was absent in all samples tested. The presence of coliforms in the ice creams may pose a potential risk for public health, especially for vulnerable groups such as children.

Detection of *pseudomonas* indicates that these ice creams could have got contaminated due to handling. *Pseudomonas* survive at low temperatures and being opportunistic pathogens, can potentially affect any individual with a low immunity.

Staphylococci enter from food handlers who may have an acute infection or from healthy carriers who harbor the organisms in their nose or throat. It is also due to improperly stored product and use of bare hands during preparation. The presence of *S. aureus* in some samples can pose a risk of food intoxication to the consumer due to the release of enterotoxins (Frazier WC., 1958).

CONCLUSION

From the current study, it can be concluded that except for one brand, since all other brands of ice creams tested failed to conform to the standards it strongly suggests the possibility of acquiring food-borne pathogens on consumption of these frozen products.

Much attention is needed to apply aspects of microbiological

quality control for attaining desired safety margins and giving assurance that the ice cream received by a consumer is pure and of good quality.

To ensure that the production, handling, processing, distribution and storage of ice cream is maintained under strict hygienic control, effective legislation needs to be enacted and enforced. Also, relevant public authorities should inspect manufacturing process more frequently.

Conflict of interest: None.

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