

Fecal Coliforms and Fecal Streptococci Contamination of Traditional Ice Cream in Tabriz

¹Javadi Afshin and ²Safarmashaei Saeid

¹Department of Food Hygiene, Tabriz Branch, Islamic Azad University, Tabriz, Iran

²Young Researchers Club, Tabriz Branch, Islamic Azad University, Tabriz, Iran

Abstract: Most of present traditional ice cream from hygienic quality has non-conforming with extant standards. Pasteurization of primary ice cream mixture with sufficient thermal processing increase hygienic quality level and causes control of primary infection. Origins of infection for traditional ice cream consist of: use of infected primary materials (milk or cream) or non-pasteurization of them. Study of infection ratio of coliforms to enterococci is one of diagnostic method for fecal infection, therefore this study was performed in order to determine the presence of fecal coliforms and fecal streptococci in traditional ice cream and also determine the ratio of fecal coliforms to fecal streptococci for characterization of infection origins. In this study, 30 ice cream samples from different regions of Tabriz were collected and after provided, enumeration of fecal coliforms and Enterococcus according to standards of Iran respectively 356, 2946, 2198 was done. In this study means of coliform and Enterococcus infection were 6.676 and 307.10, respectively. According to result of this study and by attention to mean ratio of fecal coliforms to fecal streptococci in cow, therefore cow as origin of ice cream infection in Tabriz was distinguished, this probably is for direct and indirect contact with milks.

Key words: Traditional • Ice-cream • Coliforms • Enterococcus • Ratio

INTRODUCTION

Ice cream is a frozen dessert usually made from dairy products, such as milk and cream and often combined with fruits or other ingredients and flavors. Most varieties contain sugar, although some are made with other sweeteners. In some cases, artificial flavorings and colorings are used in addition to (or in replacement of) the natural ingredients. This mixture is stirred slowly while cooling to prevent large ice crystals from forming; the result is a smoothly textured ice cream. Use of ice cream in Iran in century of 19 from Europe entered to Iran and has been fashionable. The rate of consumption for ice cream in advanced countries in 2002 about 25 liter have been reported which in Iran 1.7liter/year [1- 4]. Friedhoff *et al.* [5] have described the use of simple microbiological criteria, including aerobic mesophilic colony counts, Enterobacteriaceae counts and in some instances, enumeration of yeast, performed on samples taken during processing in small businesses to verify good manufacturing practices. This verification through monitoring was found to be an attractive alternative to the examination of end products and also

coliform bacteria are one of the most important indicator organisms that are most commonly used to ensure food safety including coliform bacteria, fecal coliform bacteria, *E. coli*, total Enterococcus spp. and aerobic plate count (APC) [6-8]. Many psychrophiles and psychrotolerant microorganisms like *Listeria monocytogens*, *Staphylococcus aureus*, *Bacillus* species, *Salmonella* species, *Shigella* species, *Streptococcus* spp., *Pseudomonas* spp., *Campylobacter* spp., *Brucella* spp. and coliform bacteria are generally present in ice cream [9, 10]. Streptococcus (group-D) (*Strep. fecalis* and *Strep. facium*) and coliforms are very important in food science, because infection with these agents in foods has in most time been reported, therefore in recent years the presence of these bacteria is considered as a best index of fecal contamination. Distinguish of coliform to enterococcus ratio is one of the common methods for determination of fecal infection in food [9, 10]. The aim of this study was to determine fecal contamination of ice cream by fecal coliforms and fecal streptococci and also determine ratio of fecal coliforms to fecal streptococci to distinguish the origin of fecal infection.

MATERIALS AND METHODS

Thirty ice cream samples from different regions of Tabriz were collected. Enumeration of fecal coliforms and fecal streptococci according to standards of Iran No: 356, 2946 and 2198 [11] was done. Ten grams from each ice cream sample were removed aseptically homogenized in 90 ml of 1.5% peptone water, using a stomacher. The homogenized samples were inoculated onto the following media; KF streptococcus agar (Merck) incubated at 37°C for 72h, lauryl sulfate tryptose broth (Merck) incubated at 37°C for 24-48h and lactose bile brilliant green broth incubated at 45°C for 24-48h [11-13]. Statistical analysis was done using SPSS (version12) program to determine central index and dispersion index.

RESULTS

According to results of this study 28.57 and 14.28% % of samples were infected with fecal coliforms and fecal streptococci, respectively. Also means of coliforms and enterococci in the present study were 6.676 and 307.10, respectively. Table 1 shows mean, standard deviation and standard error mean for enumeration of fecal coliforms and Enterococcus in the collected ice cream samples. The mean ratio of coliforms to Enterococci in samples (0.021738) was calculated.

DISCUSSION

Animal feces is an one important origin of food infection, therefore study on this subject is very important and attractive to determine the origin infection in food and in ice cream. In one study by Wilson and *et al.* [15] stated that to distinguish of human and animals fecal infection needs collection of diagnostic methods which is expensive and take much time. They added that if the ratio of fecal coliforms to fecal streptococci is more than total of enumerated coliforms infection with human feces has been occurred.

Also in one study by Wouafo *et al.* [16] in Kameron who reported that 71.3% of 300 ice cream samples were infected with fecal bacteria. In another study by Bialasiewicz and Rzadzinska [17] in lahestan, 12.3% of 195 samples infected with fecal coliforms were observed. Ankara [18] and Kastarica [19] stated that 25% and 82.5% of examined ice cream samples were infected with fecal coliforms. In studies in Libya, India and Dakar respectively, coliforms in percentages of 6, 19 and 10.6 in ice cream samples were reported [20-22], whereas in some countries no isolation of this bacteria's from ice cream samples were reported [23].

Table 1: Mean standard deviation and standard error mean of fecal coliforms and fecal streptococci in ice cream samples

-	Mean	Std. Deviation	Std. Error Mean
Fecal coliforms	6.676	20.7559	4.5293
Fecal streptococci	307.1	493.194	107.6240

By attention to findings of Pitt [14] ratio of fecal coliforms to fecal enterococci in infections with human origin is equal to 4.33, in cat 0.29, dog 0.02, mouse 0.0003, cow 0.02 and duck 0.16 and in present study this Ratio was 0.021738, so cow feces might be the origin for these infections [14].

The results suggested negligence such as poor sanitation during the preparation/or storage of ice cream. These included the observed dirty premises, used utensils and the use of bare hands in preparing the products. Even the raw milk could be a possible source of contamination. Analysis of raw milk samples in different checkpoints of milk chain system showed that the samples were heavily contaminated by both coli forms and general bacterial load [29]. In fact fecal infection is one of most important difficulties in production of ice cream and this bacteria's are considered as one of important agents of diarrhea in child's and newborns [28].

REFERENCES

1. Mohammad Hosein Movassagh, Ali Movassagh, Habib Mahmoodi, F. Servatkah and Mohammad Reza Sourorbakhsh, 2011. Microbiological Contamination of the Traditional Chocolate Ice Cream Sold in the Northwest Region of Iran. *Global Veterinaria*, 6(3): 269-271.
2. Arbuckle, W.S., 1981. Ice cream. The AYI Publishing Company, Inc. Westport, Connecticut.
3. Koçak, C., 1982. Dondurma teknolojisi. içinde: "süt mamülleri teknolojisi" 224-238, SEGEM yayın no: i03, Ankara.
4. Tamminga, S.K., R.R. Beumer and E.H. Kampelmaeber, 1980. Bacteriological examination of ice-cream in the Netherlands: comparative studies on methods. *J. Appl. Bacteriol.*, 49: 239-253.
5. Friedhoff, R.A., A.P.M. Houben, J.M.J. Leblanc J.M.W.M. Beelen, J.T. Jansen and D.A.A. Mossel, 2005. Elaboration of microbiological guidelines as an element of codes of hygienic practices for small and/or less developed businesses to verify compliance with hazard analysis critical control point. *J. Food Prot.*, 68: 139-145.

6. Jay, J.M., 2005. Indicators of food microbial quality and safety. In: *Modern Food Microbiology*, 7th ed., Eds., J.M. Jay, M.J. Loessner and D.A. Golden, Springer Science, Business Media, New York, pp: 473-496.
7. Mantis, F.N., I. Tsachv, O. Sabatakou, A.R. Burriel, A. Vacalopolos and S.B. Ramantanis, 2005. Safety and shelf life of widely distributed vacuum packed, Heat treated sausages. *Bulgarian of veterinary medicine. Bulgarian J. Veterinary Medicine*, 8(4): 245-254.
8. Pierson, M. and L. Smoot, 2007. Indicator microorganisms and microbiological criteria. In: M.P. Doyle, L.R. Beuchat and T.J. Montville, (Eds.). *Food Microbiology: Fundamentals and Frontiers*, 2nd ed. ASM Press, Washington, DC, pp: 78-81.
9. Benson, H.J., 1994. Microbiological applications: A laboratory manual in general microbiology, 6th edition, W.M. C. Brown Company Publishers, Dubuque, Iowa.
10. Jay, J.M., 1992. *Modern Food Microbiology*, Fourth edition, Chapman and Hall Inc. New York.
11. Institute of Standards and Industrial Research of Iran, 1981. Standard methods for preparation of food samples and enumeration of microorganisms in food. 1st Revision, 10th Edition, No. 356.
12. Institute of Standards and Industrial Research of Iran, 1994. Detection and enumeration of presumptive *Escherichia coli* in foods - most probable number technique. 1st Revision, 3rd Edition, No.2946.
13. Institute of Standards and Industrial Research of Iran, 1993. Method for isolation and identification of lance fields group-D *Streptococci* in food. Third Edition.
14. Pitt, R., 1998. Epidemiology and stormwater management. *Stormwater Quality Management*. New York, CRC/Lewis publishers.
15. Wilson, I.G., J.C. Heaneg and S.T. Weathrup, 1997. The effect of ice cream scoop water on the hygiene of ice cream. *Epidemiol Infect.*, 119(1): 38-40.
16. Wouafo, M.N., T. Njine and R. Tailliez, 1996. Hygiene and microbiologic quality of ice creams produced in Cameroon. A public health problem. *Bull Soc Pathol. Exot.*, 89(5): 62-358. French.
17. Rzadzinska, W. and D. Bialasiewicz, 1997. Contamination of ice cream with coli group bacteria, *Chlodnictwo*, 32: 88-89.
18. Bastepe, K., 1981. Isolation of coagulase positive staphylococci from cheese and ice cream samples sold in Ankara and some biochemical properties of the isolates. *Microbiology Bulletin*, 15: 55-63.
19. Windrantz, A., 2000. Evaluation of the bacteriological quality of ice cream sold at San Jose, Costa Rica, *Archivos Latinoamericanos De Nutricin*, 50: 3-301.
20. NeIsherf, K. Sifaw, S. Yahya, O. Saed, *et al.*, 2006. Bacteriological quality of ice cream in Tripoli Libya. *Food Control*, 17(8): 637-641.
21. Jay, L.S., D. Comar and L.D. Govenlock, 1999. A video study of Australian domestic food handling practices. *J. Food Prot.*, 62(11): 96-1285.
22. Aidara, A., A. Ranaivo and A. Spiegel, 2000. Microbiological quality of street vendor ice cream in Dakar. *Dakar Medical*, 45: 20-24.
23. Korel, F. and S. Omeroglu, *et al.*, 2002. The evaluation of chemical and microbiological quality of ice creams sold in retail markets in Manisa, Turkey. Annual Meeting and Food Expo-Anaheim, California, U.S.
24. Joshi, D.R., P.K. Shah, S. Manandhar, S. Sharma and P. Banmali, 2004. Microbial Quality of Ice Cream Sold in Kathmandu. *J. Nepal Health Research Council*, 2(2): 37-40.
25. Kokkinakis, E.N., G.A. Fragkiadakis, S.H. Ioakeimidi, I.B. Giankoulof and A.N. Kokkinaki, 2008. Microbiological quality of ice cream after HACCP implementation: a factory case study. *Czech J. Food Sci.*, 26: 383-391.
26. Maharjan, A., 1994. Bacteriological investigation on ice cream of Kathmandu Valley. MSc Dissertation. Central Department of Microbiology, Tribhuvan University, Nepal.
27. Braz J. Microbiol, 2000. 31: 2000. Bryan FL. Epidemiology of milk borne diseases. *J. Food. Protect*, 46: 637-49.
28. Soomra, A.H., M.A. Arain, M. Khaskheli and B. Bhutto, 2002. Isolation of *Escherichia coli* from raw milk and products in relation to public health sold under market conditions at Tandojam. *Pakistan J. Nutrition.*, 1(3): 1952-1955.
29. Regmi, S., P.K. Shah, D.K. Ranjit and R.P. Adhikari, 0000. Quality survey of raw milk samples in eastern Nepal. A microbiological assessment in milk chain system. *J. Nepal Health Research Council*, 1: 17-21.