ICE-CREAM & FROZEN DESSERTS

Module 11. Legal standards, microbial aspects of ice cream and safety aspects

Lesson 29
CRITICAL PROCESS FACTORS - ITS IMPACT ON ENTRY OF PATHOGENS, THEIR SURVIVAL DURING STORAGE

29.1 Introduction

Critical process factors include those important steps during the processing of ice cream which check the entry,growth and survival of the microorganisms and those factors if not optimum may lead to contamination and spoilage of the ice cream.

Some of the critical process factors in the manufacture of ice cream include pasteurization, homogenization, chilling, ageing, freezing and hardening.

29.2 Pasteurization

Pasteurization is one of the main steps that determine the microbiological quality of the finished product. The extent to which pasteurization will reduce the bacterial count depends upon the heating temperature, holding time and the type of organisms present. Fortunately pathogenic organisms are destroyed at a relatively low heat treatment. Bacteriologists agree that the tubercle bacilli (*Mycobacterium tuberculosis*) show the highest heat resistance of those that come into consideration in milk and dairy products; and it has been destroyed at 60°C for 20 minutes of heat treatment. The usual pasteurization temperature of 62.8°C for 30 minutes applied to ice cream mixes therefore allows a generous margin of safety with suspect to all pathogenic organisms that may be present. Pasteurization in excess of 62.8°C for30 minutes is helpful in eliminating *E. coli* and *Aerobacteraerogenes.*

29.3 Homoginization

The opportunities for recontamination are considerably greater in the case of ice cream mixes than in the case of pasteurized market milk.The pasteurized ice cream mix comes into contact with more pieces of equipment, and some of this equipment is admittedly difficult to sterilize. Two factors are involved in producing an increase in the bacterial count of ice cream mixes on homogenization,

a. Contamination from the homogenizer

b. The breaking up of the group's of bacterial cells.

A study revealed that the average plate count before and after homogenization of ice cream mix were 14,500 and 49,236 respectively which has accounted for an increase of 239.5%.

From various studies it was found that homogenization will usually cause an increase in the plate colony count because it breaks up groups of bacterial cells, but in addition the count will be increased due to organisms harbored in the machine. The latter factor can be controlled by efficient washing and sterilization with scalding hot water or chemical sterilizers. The piston packing represents an important source of contamination and the ideal procedure would be to replace the packing daily.

29.4 Chilling Coolers

Coolers may act as an important source of contamination if they are carelessly washed and sterilized. Surface coolers should be sterilized by pumping water at 82.2° to 87.8°C over them in ample amounts so that the entire surface is actually heated. Chemical sterilization with chlorine at 100 ppm level is advocated. Tubular coolers can also be sterilized with hot water. Chemical sterilization is frequently used and it should be done just before the equipment is used.

29.5 Ageing

If ageing conditions are moderately good, there will be little increase in the bacterial count of the mix. It is well known that the growth of bacteria is very slow at the temperatures commonly used in ageing ice cream mixes. The ageing procedure should therefore be undertaken only if accompanied by a program of efficient sterilization of equipment.

29.6 Freezing and Hardening

An increase in the plate colony count which is commonly observed when the mix is frozen into ice cream involves two factors

a. Breaking up of group of cells

b. Actual contamination from the freezer.

The latter factor is therefore difficult to evaluate, but it is obvious that the freezer may be as important source of bacteria if it is carelessly washed and sterilized. During the hardening of ice cream and storage in a hardened condition there is usually a gradual decrease in the bacterial count. While there is no agitation involved in the hardening, the scattering of cell groups may still tend to increase the count due to the disrupting effect of the ice crystal formation.

During the storage of ice cream in a hardened condition at -17.8°C, or lower there is a

gradual decrease in the count, but this is slow that it is of no value in the problem of meeting bacterial standards. Temperature fluctuations during storage are likely to have an effect on the count. Slight softening of the ice cream is likely to cause an increase in the count.

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