Summary

To provide the safest and highest quality of milk and milk products to the consumer, milk is to be processed before marketing. The processing helps produce milk that has an initial low bacterial count, good flavour and satisfactory keeping qualities. Milk processing operations consist of filtration, clarification, pasteurization, sterilization and packaging. Filtration involves the removal of foreign matter i.e., straw and hair pieces, dust particles, leukocytes (somatic cells or white blood cells), insects, etc. Clarification is employed to remove insoluble impurities especially the finer ones. It involves the use of a centrifugal machine called 'clarifier'. In addition bactofugation' is also used for removal of bacterial spores from milk, which are difficult to inactivate by heat treatment and are heavier than vegetative cells.

In order to improve the keeping quality of milk, and render safe for human consumption, milk is pasteurized and sterilized before storage. Pasteurization is a process of heating every particle of milk to at least 63°C for 30 minutes or 72 °C for 15 seconds in approved and properly operated equipment. After pasteurization milk is immediately cool to 5°C or below. Sterilized milk may be defined as milk which has been heated to a temperature of 100°C or above for such lengths of time that it remains fit for human consumption

Consortium for Educational Communication

for at least 7 days at room temperatures. Sterilized milk has remarkable keeping quality and does not need refrigerated storage. UHT processing is also used for increasing the prolonged shelf life of milk. UHT product is obtained by heating milk in a continuous flow to a temperature in excess of 135°C for not less than two seconds and immediately packaging in sterile packages under aseptic conditions. After processing milk is packaged in different types of packaging materials. The most commonly used packages for milk and milk products are laminates/cartons made up of paper, polyethylene and aluminum foil are co-extruded to form a laminate, plastic films and preformed packages of different shapes and sizes are also used for aseptic packaging of value added dairy products.

Processing of Milk

1.1 Filtration and Clarification of milk

i) Purpose

Raw milk as produced on the farm and transported to the collection centre or a dairy plant generally contains varying amounts of visible, invisible impurities. This foreign matter includes straw and hair pieces, dust particles, leukocytes (somatic cells or white blood cells), insects, etc. Relatively large pieces of such material e.g. straw, hair and insects, are usually removed by 'straining' (passing the milk through a fine metal–gauge strainer or metallic sieve on the farm, at the collection centre or at the processing plant. Tubular sieves located in the milk inlet pipe to the processing unit (e.g. pasteurizer) are also used. However, finer foreign matter to be eliminated requires clarification using a special filter or a centrifuged clarifier. These steps of aesthetic improvement of product are particularly useful for overcoming the problem of sediments in fluid milk and liquid milk products in general, and homogenized milk in particular.

ii) Filtration

Filtration refers to making the milk pass through a filter-cloth or filter-pad. The filtering medium has a pore size (25-100 mm) that permits most of the foreign matter to be retained on it. The milk filter consists of a nylon filterbag or a filter-pad supported on a perforated stainless steel (SS) support held in an SS enclosure with a tight-fitting lid, milk distributor, and inlet- and outlet- connections. Milk usually passes from top to bottom. In case of twin filters, three way valves in the inlet and outlet lines enable switching from one filter to the other when the first is to be cleaned. Sometimes, filters may be provided in the form of cylindrical bags or 'stockings' fitted over perforated SS tubes as in the modern continuous pasteurizing plants (hightemperature short-time, or HTST pasteurizers Filtration can be carried out either on cold milk (about 10 °C) or warm milk (40-45 °C). Since warm milk filtration is more rapid due to lower viscosity of warm milk, it is universally used. For cold filtration, the filter is located in the line connecting the milk receiving tank or holding tank and the pasteurizer.

iii) Clarification

As an alternative to filtration, clarification can also be employed to remove insoluble impurities especially the finer ones. It involves the use of a centrifugal machine called 'clarifier'. Thus, clarification is a process of subjecting milk to a centrifugal force in order to eliminate the finer but heavier particles from milk, somatic cells, dust particles, etc. Although part of bacteria is also removed along with the extraneous matter, clarification cannot be considered an effective means of bacteria removal. In clarification process, when milk is introduced between two adjacent rotating conical discs (in a stack of several discs) of a centrifuge bowl, it is subjected to a centrifugal force. There is no separation of fat globules (cream) and skim milk in a clarifier. Raw milk is made to pass usually under a pump pressure, down a central pipe of a rotating bowl and led to the outer edge of the clarifier discs through a distributor in the bottom and then onto the spinning discs, where milk and dirt are separated. The milk is led to the discharge port at the top of the bowl whereas the dirt is accumulated in the sediment space. The accumulated sludge is removed from the bowl by dismantling the clarifier at regular intervals. The interval may range from 1 to 8 hours depending on size of the clarifier and the amount of impurities in the milk. As for the milk filter, clarifier may be located in the raw milk line between the raw milk tank and pasteurizer. Alternatively, milk may be clarified warm/hot by placing the clarifier at a suitable point in the regeneration section of the HTST unit or between the regeneration and heating sections. The clarifier sludge or clarifier 'slime' consists primarily