

FOOD PROCESSING AND SAFEGUARDING

S. EKANAYAKE

*Central Agricultural Research Institute,
Gannoruwa.*

Milk curdles, meat and egg putrefy or get rotten mould is formed on bread, fruit juices ferment. This change in food and drink produces toxins or poisons caused by the presence of certain micro-organisms which in turn cause severe illness often termed as food poisoning. These micro organisms like bacteria, moulds and yeasts have one speciality-they grow and reproduce very fast. One milli-litre of fresh milk (about 16 drops of milk) has about 4,300 bacteria. With refrigeration, the count of bacteria remains almost the same for 48 hours. But at 15^o C centigrade this number grows to over 1.5 million in 24 hours, 35 million in 48 hours, and almost 10 times this figure in 72 hours.

People generally think that putrefied food can cause food poisoning. But the fact is that putrefaction does not ordinarily produce toxic substances. In many parts of the world rotten meat is considered a delicacy. Rotten eggs are eaten in some countries. Some foods in themselves contain putrefactive bacteria. At the same time, food that looks good may not actually be so, since some bacteria do not create any external change when they grow in meat, fish, vegetables dairy and poultry products.

In some cases when food goes bad, it produces only minor changes in colour, flavour, odour or texture. But in other cases changes are more substantial.

Most food and drink can be preserved for varying periods of time by refrigeration and some of these for longer periods in frozen conditions. There are, however, other ways to safeguard food and drink from the attack of micro-organisms-like smoking, salting and canning.

Just as living being not only survive but also thrive in a healthy and favourable environment bacteria also

grow and multiply in a conducive atmosphere. If bacteria do not find the environment favourable they die. This is exactly what is done through the food preservation process.

Fresh fruits and vegetables can be stored in refrigerators for limited periods. But when foods are frozen, not only do they become less perishable, but their original freshness does not undergo much change. Frozen foods can be stored for long periods. For example, various meats can be kept good in refrigerators from one to three weeks, but can be preserved in frozen conditions sometimes upto eight months. Poultry products can be stored in refrigerators for a week, but preserved upto one year when frozen. Fish can remain fresh with refrigeration upto a week at most but by freezing it can be preserved upto one year. Fresh fruits and vegetables are living organisms.

They respire or breathe and while doing so give out carbon dioxide and water. As a result heat is generated and that is why most fresh fruits and vegetables cannot tolerate long periods of refrigeration. Often their chemical composition undergoes a change.

Safeguarding the 'health' of food products through the process of freezing is not new thing. Frozen fish and meats were available in the United States towards the last quarter of the 19th century.

Whatever be the method used for the freezing process, the basic principle is to freeze food products as quickly as possible. The faster the method, the more fresh the food will preserve. Losses in nutritive value of frozen food and drink are negligible during the freezing process. Fruits retain their high vitamin C content. Fish, meat and cereals maintain their high nutritive value. Preservation of food and drink through excessive heat is done by pasteurisation or by canning.

Name after Louis Pasteur, the famous French chemist-cum-bacteriologist, pasteurisation in very simple terms means subjecting food items to high temperatures and maintaining them at that for long periods in order to kill moulds, yeasts, bacteria and other harmful micro-organisms. Normally the process of pasteurisation is applied to fruit juices, fruits and bottled fluid milk. Such food items are pasteurised in containers as well.

Canning, on the other hand, is normally done after the food is sealed in containers or cans. Foods are pre-heated before being put in cans or containers in certain cases only. In the process of canning, the sealed containers containing food are subjected to heat treatment so as to make the food sterile. Since heating can cause changes in the flavour, colour or 'look' of the food the heat process during canning is done at low temperatures.

Higher temperatures are required for processing non-acidic foods like vegetables, meat, fish, poultry and milk. These high temperatures ranging from 115°C centigrade to 120°C centigrade are obtained by heating under the pressure of steam.

There may be some loss of minerals or vitamins in the process of canning, but it has been noted that canned foods generally have a higher nutritive content and food value than fresh foods prepared at home. The reason is mainly that canning factories get food items directly from the source (whether it be growers, breeders or planters), and then process it under carefully controlled conditions with the minimum delay. Food procured from markets is seldom fresh, as it takes several days for fresh fruits and vegetables to reach us after they are harvested. This length in time elapse results in nutritive loss.

Sugar and salt are very important chemical preservatives. Anything containing 65 per cent or more sugar does not allow the growth of moulds, bacteria and yeasts. To make doubly sure of food preservation, products containing 65 to 70 per cent sugar (like jams, jellies etc.) are mildly heated in sealed cans or containers.

Salt is used as a preservative for meat and fish and certain vegetables. Although salt in itself does not destroy bacteria, it keeps the bacteria causing decay under control. When some vegetables are treated in brine (which is the other name for salt water) lactic acid is formed which starts a sort of fermentation action. This also helps in food preservation.

Smoking is another way in which food can be preserved. After salting, some foods like fish and meat are smoked by subjecting them to smoke created by the partial burning of wood. Smoke kills micro-organisms that come in its contact.

Besides sugaring, salting and smoking, the most common method employed in preservation is by the use of acids. The most commonly used acid for this purpose is acetic acid (vinegar). This is an essential ingredient in the preparation of salad dressings, pickles and acharis. The discolouration of certain frozen fruits is stopped by the addition of ascorbic acid. The growth of certain micro-organisms is prevented in foods like carbonated beverages, pudding powders, gelatin desserts by the addition of citric acid, lactic acid (present in sour milk) or tartaric acid.

Certain chemicals like sulphur dioxide, sodium benzoate and antibiotics are also used in the food preservation process for certain dried fruits, fruit juices and for prolonging the cold-storage life of poultry etc. However, the use of some of these is prohibited in a few countries, like the United States and Canada.

The removal of water from food creates an environment in which microbes cannot multiply or grow, thus saving it from decay.

Today modern technology employs the use of dehydration which simply means the removal of water under controlled humidity and temperature conditions, unlike the old sun-drying or shade-drying system. Today many dried and dehydrated foods are available.

In certain cases, the water content is removed only partially and the product made into a concentrate.

The most common example is condensed milk which is just a concentrated form of milk with a partial water content and sugar added to help preserve it.

Preservation by fermentation is another method which is commonly used. Lactic acid is frequently used to ferment milk and yoghurt is the end product with which we are all too familiar.

We may refrigerate, freeze, pasteurise, can, dry or dehydrate, salt, smoke, sugar, or ferment food and drink. All we are trying to do is to create unhealthy conditions for micro-organisms so that they cannot grow or multiply. We, in the process, safeguard our food and drink from spoiling on the one hand and prolong their shelf life on the other.