ONE KEY to keeping our food supply safe is the elimination, prevention, or control of problem-causing microbes. Microbes, especially bacteria, can be nearly impossible to destroy completely. Sometimes, inhibition, or the prevention of microbe growth, is not possible either. Methods of slowing down the growth may be used. The alternatives when dealing with food microbes are to kill the microbes or to change the environment of the food so that microbes will not grow or thrive there.

Objective:

☑ Explain the various methods of controlling microbial growth.

Key Terms:

- food additives
- inhibition

Controlling Microbial Growth

When food processors or consumers want to kill microbes, the least expensive and most effective way is to use heat. By simply cooking food at a relatively high temperature, most problem-causing microorganisms are destroyed. Many of the “ready-to-eat” food products that we buy and eat have been precooked to prevent the growth of microbes. Some foods, like fresh ground beef, are not precooked and therefore must be cooked by the consumer before eating. Eating a hamburger that is still pink in the middle means that the inside was not exposed to
enough heat to kill microbes that could be present. Couple that with the fact that ground beef has plenty of opportunities for contamination in the production and handling, and you have a recipe for bacterial growth.

Blanching, or the exposure of a food to extremely hot water for a few seconds, inactivates enzymes that will deteriorate the food and allow microbes to enter. Blanching is a common process for fruits or vegetables that will be frozen for later use.

Pasteurization is a process used in the milk industry to kill microbes by heating milk to a temperature of 145°F (63°C) for 30 minutes. Although pasteurization provides consumers with a safe, quality milk product, the process does not kill all the microorganisms present in milk. It is for this reason that milk must be refrigerated to slow the growth of the surviving microbes. Eventually, even with refrigeration, the microbes will grow and spoil the milk, giving it that sour smell and flavor. Pasteurization is also used with certain juice and egg products.

The other possibility for microbial death is the use of extremely cold temperatures. Microbes, like most organisms, have a certain amount of moisture in their cells. When frozen, the moisture expands, causing extensive cell damage and deterioration upon thawing. Although this may seem like a good method of control, the food itself is also damaged when frozen and deteriorates faster upon thawing, providing once again a perfect site for microbial growth.

Food producers who wish to provide safe food products that will have longer shelf lives have developed methods of microbial control by changing the environment of the foods themselves. When the environment is changed, the microbes are not eliminated from around the foods, but they have difficulty growing on the food products.

One of the easiest ways to make the food environment more hostile for microbes is to reduce the amount of moisture present. Since nearly all microbes require moisture to carry out their life functions, the absence of moisture stops them in their tracks.

Another method to change the food environment is to use food additives, or substances designed to retain or improve the desirable characteristics of the food. Food additives, such as sulfur dioxide, potassium sorbate, sodium propionate, and sodium benzoate, are all used to prevent the growth of microbes in food. Other additives can be used to change the pH of food, making it difficult for microbes to thrive.
Processing methods can also be used to control microbial growth. Most of these methods can be performed right in our very own kitchens as well as in large-scale processing plants. Some fresh foods are canned before they are shipped and sold to consumers. Canning requires food to be heated to a high temperature while under pressure. The result is the death of microbes because of the heat and the prevention of further contamination because of the vacuum sealing of the container. Vegetables, fruit, and a variety of other products (especially those with high-acid content) that have been properly canned can be stored safely for months and sometimes years.

As we stated earlier, freezing is another common processing method. Without the use of additives and preservatives, our food sources could never be harvested, processed, and shipped all over the world while still maintaining the quality that consumers want. Additives have the ability to reduce the action of microbes that would normally invade and deteriorate the food. Except for fresh fruit and vegetables, nearly all processed foods use additives to preserve freshness and improve their characteristics.

Set up an experiment in which a control group of food samples, such as apple wedges, bread, and cheese, is observed for mold growth. Set up a second group of food samples treated with food preservation. With a microscope, observe the growth of molds and bacteria on the samples for five days. As an alternative, homemade preservative solutions could be created and tested on food sources.

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that kills microbes and prevents their growth. Just think of what our lives would be like without frozen pizza!

Dehydration is also commonly used by food manufacturers to prevent microbial growth. Dehydration is the removal of water from a food product. When moisture is removed, the microbes cannot function and soon die. Dehydrated foods can be stored for long periods, given that their packaging can keep moisture out. Many of our favorite food items—instant noodles, cocoa mix, snack foods, baking mixes—are dehydrated.

**Summary:**

Various methods are used to eliminate, prevent, or control problem-causing microbes. Heat from cooking, blanching, and pasteurization is very effective, as is extreme cold. Changing the food environment by reducing moisture levels or by using food additives can make it more difficult for microbes to grow on food products. Various processing methods, such as canning, freezing, and dehydration, control microbial growth.

**Checking Your Knowledge:**

1. Name four methods of controlling food contamination by microbes? Explain each method.
2. What is a food additive?

**Expanding Your Knowledge:**

Obtain a variety of packaged food items from your home or local grocery store. Examine each item and list the methods used by the processor and the packager to keep the product fresh.

**Web Links:**

- Science and Our Food Supply

- Dairy Microbiology
  [http://www.foodsci.uoguelph.ca/dairiedu/micro.html](http://www.foodsci.uoguelph.ca/dairiedu/micro.html)

- Agricultural Career Profiles
  [http://www.mycaert.com/career-profiles](http://www.mycaert.com/career-profiles)