

Spoiling for a Food Fight

Food is subject to spoiling. As soon as a food is harvested it can start to spoil. Spoiling means to lose quality and can take many forms with food. Fruits and vegetables will continue to ripen and eventually get soft, mushy and unappealing. Foods might mold or decay from bacteria. In order to preserve food it must be protected from some things that cause it to spoil. Oxygen, mold spores, bacteria, light, insects, and rodents can be involved with food spoiling.

Protecting food from these enemies includes processes such as cooking, freezing, refrigeration, drying, irradiating, canning, pasteurization, and pickling. All these methods are used to block the enemies of food.

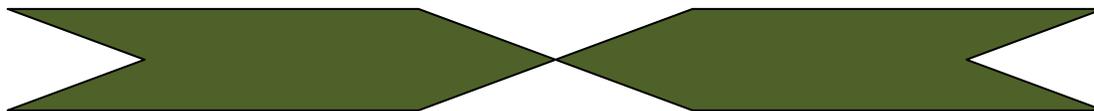


Freezing and refrigeration lowers the temperature of food, and thus slows the activity of molds and bacteria. Cooking heats the food, and thus kills many of the bacteria and molds. Canning combines cooking and sealing food away from oxygen and the critters like bacteria, mold, insects and rodents. Pasteurization heats food, usually a liquid like milk, up to a specific temperature and holds it at that temperature for a set time and then rapidly cools it. This kills many bacteria and slows the spoilage of these liquids. Pickling uses an acid like vinegar to make the food too acidic for spoiling critters to live. Drying takes away the water that the food spoilers need to survive. Radiation can be used to kill molds and bacteria. The various preservation process target food spoilers and keep them from attacking our food.

Preservation allows foods to be held for longer periods of time, and makes it possible to transport it long distances. But the preserving also changes the food. A canned peach doesn't taste like a fresh peach. Pickles don't taste like fresh cucumbers. Many of these food preservation methods have resulted in new foods, that have become important as cultural icons and traditions. So they stay with us.

Some foods are designed to spoil as part of their natural role. If you peel an apple and allow oxygen get to the apple, it will start to turn brown. The oxygen activates an enzyme in the apple that starts a browning process. Things like apples, bananas, avocados and potatoes turn brown when exposed to oxygen. This makes them less appealing and eventually inedible. To stop the browning you need to block the enzymes that cause the process. Bathing the food with lemon juice or other acids block the chemical process of the enzymes. Blanching, placing food in boiling water for a short period, denatures or breaks down the enzymes with heat. Refrigeration or freezing slows the process. The food can be placed in a gas (such as nitrogen)

that keeps oxygen from the food. You can do some easy experiments that demonstrate this process.



The Great Browning of Our Food

Peel an apple and cut it in half. Be careful using knives and have an adult help if you aren't allowed to use knives.

Put one half of the apple on a plate, cut side up. Dip the other half in lemon juice. Wait and watch. Observe what happens, and record what you observe. Repeat your observations every 5 minutes. What happened?

Bananas are also a good subject to study with browning. You can study the browning process with bananas and a sample experiment can be found at the University of Maine's website.

Enzymatic Browning Experiment:

<http://www.umaine.edu/NSFGK-12/images/PDFs/browning2.pdf>

Did you know that this browning process is sometimes used as a way to make the food? Raisins are dried grapes. What color are raisins? The raisin color comes from enzyme browning. Golden raisins are treated to prevent the color change. Figs and other dried fruits get their rich brown colors in the same way. Tea is made from leaves of that are allowed to brown, with this enzymatic process producing the dark color and flavor. The color and flavor are the by-product of the enzymes called tannins.

This next set of experiments are simple food science activities to allow you to further explore food, spoilage, and to better understand how food scientists study foods and how to improve them. You can explore being a food scientist at:

<http://foodscience.psu.edu/public/kitchen-chemistry>.