

# VIRGINIA COOPERATIVE EXTENSION SERVICE

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Dear Food Preserver:

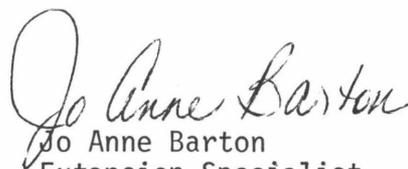
Many different reasons are given for home food production and food preservation. A 1975 survey of home gardeners turned up three major reasons for having a garden: (1) a preference for the taste of fresh fruits and vegetables, (2) a desire to save money on the food budget, and (3) as a hobby. A fourth reason given by only 10 to 15 percent of the gardeners was to have food to can or freeze.

The survey did not look into reasons for freezing and canning food at home. If it had, these reasons would probably have surfaced: (1) to save money on the food budget, (2) to have control over the quality of the food (less sugar, no salt, elimination of other food additives), (3) as a hobby, and (4) to preserve surplus food.

You might check your own motivation for having a garden or for preserving food. Do you feel that your family eats a greater variety of foods as a result of having home preserved foods? Do you get satisfaction from looking into a full freezer or pantry? Or are you in the group that cans or freezes food just because it is there and you are afraid it will go to waste? If you're in the latter group, let me remind you that this is akin to refrigerating leftovers for a week before throwing them away!

This series of lessons is designed to provide you with the basic information needed to preserve a variety of foods so that they will be of high quality and safe to eat. If you need additional information, contact the Virginia Cooperative Extension Service office in your city or county.

Sincerely,



Jo Anne Barton  
Extension Specialist  
Foods and Nutrition

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## Principles of Food Preservation

There are two major goals in storing food. They are  
(1) to maintain high quality  
(2) to prevent the growth of organisms which can cause illness

Food must be of high quality to start with if the first goal is to be achieved. No method of food preservation improves the quality of food. In fact, there is usually some loss of quality.

The nature of the food, the storage period, and the storage conditions must be considered when choosing a preservation method. For example, a food which will be stored for only a day or two in the refrigerator requires a less drastic treatment than if it is to be stored at room temperature for several months.

Food is constantly changing. Some changes are desirable such as the ripening of fruit with accompanying changes in color, flavor, and texture. If ripening continues to overripeness, the change becomes undesirable.

Enzymes, yeasts, molds, and bacteria are responsible for changes in foods. All are referred to as microorganisms--they are too small to be seen with the naked eye. Yeasts, molds, and enzymes cause changes in food quality but rarely affect the safety of a food.

Most microorganisms require moisture, a food source, and air (oxygen) in order to do "their thing." Activity is greatest at temperatures between 60° and 120°F. Activity may refer to changes in color, flavor, or texture or to an increase in numbers of microorganisms, or to the production of a toxin (poison) by the microorganism. Lowering the temperature will slow activity. This is what happens when food is refrigerated. Freezing food slows activity even more, but it does not destroy the microorganisms. Thus, when food is thawed, activity resumes.

Raising the temperature also slows activity. If the temperature is raised sufficiently, microorganisms are killed. Yeasts, molds, enzymes and some bacteria are destroyed at temperatures between 160° and 212°F.

The food is an obvious source of food and moisture for microorganisms. Moisture can be removed by drying or can be tied up by adding large quantities of salt or sugar. However, the amounts of salt and sugar used in canning and freezing are not great enough to have a preservative effect and can be omitted from a food safety standpoint. There is enough sugar in jams and jellies to prevent bacterial growth, but there may be some mold growth.

The acidity of the food as well as the density affects processing. Foods are grouped as "acid" and "low-acid" for purposes of selecting the appropriate processing method. Acid protects against the growth of spoilage organisms, particularly botulism. Thus, the heat treatment need not be as severe for foods in the "acid" group as for foods in the "low-acid" group.

The degree of acidity or alkalinity is expressed as pH using a scale from 0 to 14. The center of the scale--7--is neutral, neither acid nor alkaline. As the pH moves away from 7, the foods become increasingly acid or alkaline. Pumpkin has a pH of 5.3; red cherries have a pH of 3.4; thus, cherries are more acid than pumpkin. Most foods are acid, as few have a pH above 7. An exception is hominy which has a pH of 7.5.

Foods with a pH below 4.5 are classified as "acid," while foods with a pH between 4.6 and 7.0 are classified as "low-acid." It might be more appropriate to describe the latter group as "low-in-acid."

Taste is a guide to acidity. Generally, sourness and acidity go together. The red cherries are certainly sourer than the pumpkin in the earlier example.

### Botulism

One bacteria of particular concern to the home canner is Clostridium botulinum. Botulism is the deadliest and rarest kind of food borne illness. The organism lives on dead and decaying organic matter and is found almost everywhere in nature--in soil, dust, on fruits, vegetables, and other foods. In its dormant or resting phase as a spore, it can survive for years. The spores themselves are not harmful, but they are capable of producing a deadly toxin.

The spore has a great tolerance for heat and other environmental stresses so is very difficult to destroy. In addition, Clostridium botulinum, unlike most other spoilage organisms, grows best when there is no air or free oxygen in its environment. Thus the conditions inside a sealed jar of food are ideal for toxin production. A temperature higher than 212°F is required to destroy botulinum spores. The use of a pressure canner enables us to achieve temperatures higher than 212°F. At 5 pounds pressure, the temperature inside the canner is 228°F; at 10 pounds pressure 240°F; and at 15 pounds pressure 250°F.

It isn't enough to get the canner to the desired temperature. All pieces of food in each jar of food must reach that temperature. Each food heats at its own rate; that's why processing times are different for each food. Generally, heat travels faster in a loosely packed product than in a tightly packed one. For example, heat travels faster in a jar of green beans packed in water than in a jar of solidly packed greens. Whole kernel corn packed in water heats much faster than cream-style corn. And it obviously takes longer for heat to reach the center of a large jar than of a small one. A pint of tomatoes (raw pack) should be processed for 35 minutes in a boiling water bath but quart jars must be processed for 45 minutes. The temperature of the food when placed in the canner also influences processing time. If tomatoes are brought to a boil and packed into jars while boiling hot, the processing time is just 10 minutes.

Your Assignment

Answer these questions. (You'll find the answers in the lesson.)

1. Name the 4 types of microorganisms which cause changes in foods.
2. Of the 4 types of microorganisms, which is most apt to affect the safety of foods?
3. Why do foods which are in the "acid" group need less drastic heat treatment than foods in the "low acid" group?
4. Why do foods that have been frozen need to be refrigerated after thawing?
5. How does a sealed jar help to minimize changes in food quality and/or safety?

### Which Foods Should You Preserve?

Each family must make its own master plan of foods to be preserved and quantities to be preserved. Consider the following factors in making your plan.

- 1) Family likes and dislikes. There's nothing to be gained by stockpiling okra in the freezer if no one in the family likes okra. Even if all four family members enjoy applesauce, there's a limit to the number of quarts which can be used in a year. A supply of fifty quarts of applesauce means each family member will have at least a cup of applesauce per week.
- 2) Remember to allow for availability of fresh produce during the growing season. Some foods have a short season--strawberries and asparagus, for example, while others have a much longer season--greens, green beans, tomatoes, and apples.
- 3) Preserve for one year. It is rare to have a complete crop failure in any one year. Food will be safe to use for longer than a one year storage period but it gradually loses quality.
- 4) The year round availability and cost of the food through commercial channels. For example, fresh carrots and potatoes are available year round at reasonable cost. Assuming that you could get a pound of potatoes into a pint jar for canning, there would be a 3 to 5¢ cost for a new lid plus the cost of processing. To freeze potatoes, a plastic bag or container would be needed. Fuel is required for blanching the potatoes, for freezing the potatoes, and for keeping them frozen. All of that may add up to more than the 9 to 12¢ per pound cost of fresh potatoes, and neither canned nor frozen potatoes is equal in quality to fresh potatoes.
- 5) The cost of added ingredients as well as the cost of the food itself. It is easy to calculate the cost of purchased produce but it may be more difficult to determine the cost of homegrown produce. Costs of seeds or plants, tilling, fertilizer, pesticides, and water for irrigation must be considered along with yield in calculating the actual cost. The quantity (and value) of produce used fresh may exceed that preserved.  
  
Sugar adds to the cost of preserving fruits; vinegar and spices add to the cost of pickling.
- 6) The cost of processing food. Fuel is expensive and must be counted in the total cost of preserved food. More fuel is required for freezing than for canning. Why? Fuel is used only at the time of processing canned foods but is used continuously to keep food frozen. More about fuel costs in later lessons. Special equipment is needed for most food preservation. A \$50 investment in a pressure canner may be prohibitive for the beginning preserver.

- 7) The time required for preserving food. Canning and freezing do take time. If you work away from home, you may have little time to invest in food preservation. Even if you are a fulltime homemaker, you may find more profitable ways to spend your time.

To illustrate, a bushel of spinach will yield an average of 6 quarts of canned or frozen greens. Each leaf must be picked, looked over for insects, and washed several times before processing. A bushel will yield less than a full canner but will still require 90 minutes of processing at 10 lbs. pressure. It's a 3 to 4 hour job for one person! Is it worth it? (You could reduce the time by freezing rather than canning the spinach.)

Shelling peas may be a family project but it takes time, even with helping hands, to reduce a bushel of peas in the pod to the shelled form for canning or freezing.

- 8) Food on hand. If you have food left from previous years, plan to use it first. Reduce the amount to be preserved this year. Discard food which has been stored for several years, freeing up the jars and containers for use this year.

### Your Assignment

List foods to be preserved on the form below. Allow one-half cup of canned or frozen vegetable or fruit per serving. A pint jar or freezer container will yield 3 to 4 servings; a quart jar 7 or 8 servings. Some family members will want smaller or larger servings, however.

In future lessons, we will discuss specific methods of food preservation including how, why, and costs. You may change your plan as you gain additional information.

Food	Frequency of Use	Amount needed to serve family	Number of Times	Total quantity needed	Can	Freeze	Other
Strawberries	2 times/mo.	1 Pint	20	20 Pints		20 Pints	5 Pints jam
Green Beans	2 times/wk.	1 Pint	70	70 Pints	50 Pints	20 Pints	

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