Grow It Eat It Preserve It
Food Preservation Curriculum
Grow It Eat It Preserve It

Instructor Guide

Developed by University of Maryland Extension (UME)
Food Preservation Action Team members

Lynn Little, MS
Rebecca Davis, MA, MS
Dhruti Patel, MS

Contributors and Reviewers

Liat Mackey, MAgr, RD, LDN
Terri Serio, MA
Sandy Corridon, MS
Donielle Axline, MS

Graphic Design

Patricia Moore
David Hirner
Diane Woodring
Introduction

Welcome to UME’s home food preservation program: Grow It Eat It Preserve It!

In Maryland, food preservation has become a hot topic. Everything from economics to a return to home gardening and interest in local, fresh food has fueled this resurgence. This has resulted in an increasing number of consumers wanting to learn up-to-date, evidence-based techniques for preserving foods at home. In addition, the National Institute for Food and Agriculture (NIFA), has identified home food processing and preservation as a priority food safety issue for Americans.

The home food preservation revival is not limited to rural communities; many urban residents are participating in community supported agriculture (CSA’s) or buying their produce from local sources and farmers’ markets. This trend has led to an increase in requests for UME Family and Consumer Sciences and 4-H educators in cities and rural areas to provide educational opportunities for the public and volunteers to learn safe, evidence-based food preservation techniques.

Grow It Eat It Preserve It (GIEIPI) Instructor’s Guide

The tools to reach out to consumers in your community interested in learning home food preservation techniques are contained in this instructor’s guide. The teaching materials are divided by high-acid (water bath) and low-acid (pressure canning) preservation techniques. The curriculum includes five teaching modules on the following topics:

• High-acid Canning
• Jams and Jellies
• Pickles and Pickled Products
• Low-acid Canning
• Tomatoes

The teaching materials are organized so that educators may choose to teach a general overview of the techniques or teach a workshop on how to preserve more commonly home-canned foods, i.e., jams, pickles, or tomatoes. Each module is designed to take approximately 3.5 to 4.5 hours and is divided into two main sections: The first classroom section is devoted to learning basic steps and safety principles. The second section consists of a hands-on activity where participants have the opportunity to practice what they learned and can a particular food using either pressure or water-bath canning.

How much time you need to complete the educational presentation and the hands-on portion of the workshop depends on many things, including the technique you are teaching, the number of supplemental activities you incorporate into your program, the food item you have chosen to can, as well as how many
participants are in your class. Generally, a good guideline to follow for the water-bath canning workshop is to allow:

a. approximately 2 to 2.5 hours for the first part of the educational component and supplemental activities;

b. 1 to 1.5 hours for the hands-on-canning portion; and

c. 30 to 60 minutes for the remainder of the slide presentation, questions, clean up and review.

When you review the slides you will note that there are two sections separated by a “Let’s Go to the Kitchen” slide. This enables you to cover the essential steps and procedures before beginning the hands-on component. While your food items are processing, you can finish the classroom section of your program, alleviating the down time that may occur if you cover all of the educational materials and then do the hands-on portion of your program.

This is even more important for the pressure canning workshop because of venting the canner, processing the food, and depressurizing the equipment takes time. Consequently, the “Let’s Go to the Kitchen” slide appears earlier to allow extra time needed for the pressure canning process. Time guidelines for the pressure canning modules are the same as water-bath canning except that you will cover only basic information before going to the kitchen for the hands-on portion of the class. Save the supplemental activities and the remainder of the materials to cover while the food is processing. Safety note: Never leave the equipment unattended. Pressure canners need to stay at the required pressure for the food to be safe for consumption and water-bath canners must stay at a rapid boil. If your classroom is separate from your teaching area, please ask a colleague to time and watch the canners while you finish your class.
Gas stoves work better for your canning workshops but you can use electric stoves as well. Smooth cooktops are not recommended (http://nchfp.ugaa.edu/publications/nchfp/factsheets/smoothtops.html). You will need a kitchen that has a water supply, sink and plenty of counter space to accommodate the hands-on activity. Keep your class size manageable (12 to 15 participants) if you are teaching alone. The hands-on learning activity is important and you want to make sure everyone is doing it properly.

In the Appendix section you will find a handout, Checklist for Successful Canning, which contains a list of suggested materials needed to conduct your classes. These are just suggestions; as you become more experienced you will find what works best for your needs.

The GIEIPI modules are supplemented by a variety of resources to reinforce important principles and allow learners to be successful at home food preservation. These resources include handouts on various topics such as general food safety, freezing techniques, and other food preservation topics. The evaluation instrument used by UME educators is also included. You can adapt this tool for your program since evaluation is critical to knowing that you are meeting your constituents’ needs.

We also recommend using the latest edition of So Easy to Preserve and/or the USDA Guide to Home Food Preservation to supplement your food preservation workshops. You will see these resources referenced throughout the instructor’s notes enabling you to easily refer directly to these materials for additional background information.

**Working with Adults**

Most adult learners learn best when they can connect what they are being taught with what they already know.¹ The GIEIPI curriculum combines the delivery of new information with practical opportunities to apply the knowledge. Whenever possible, we suggest you encourage comments and questions by dividing participants into small groups for discussion and learning from each other.²

Throughout the curriculum, the GIEIPI authors recommend a variety of activities to actively engage learners in applying new knowledge. We encourage educators to begin each workshop with a review of participants’ experiences and ideas about home food preservation. In addition, the hands-on component of the workshop is critical: adults want to be able to practice what they learn. Supplemental activities are included in the teaching notes and as a handout in the Appendix.

Authors: Lynn Little, Rebecca Davis, and Dhruti Patel

This publication, Grow It Eat It Preserve It Food Preservation Curriculum (EC-03-2013), is a publications of University of Maryland Extension and Family and Consumer Sciences Program. The information presented has met UME peer review standards, including internal and external technical review. For more information on related publications and programs, please visit http://www.extension.umd.edu

The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.
Welcome participants. Introduce yourself and ask everyone to make a name tent/tag. This session covers how canning preserves food, safe food preservation practices and how to safely process a high-acid food using a water-bath canner.

**Introduction Activity**

Have each participant introduce themselves and relate their experiences with canning and why they are interested in taking the class. Regardless of the experience levels of participants, reassure everyone that this class is appropriate for all levels.
Please give University of Maryland Extension credit for developing these materials.
There are two approved methods for canning foods at home. They are not interchangeable methods. High-acid foods are canned in a water bath canner while low-acid foods MUST be canned in a pressure canner. We will learn more about why later.
Home food preservation is a science and an art. Today we will explore the science of food preservation and identify recommended safe food preservation practices. We will do a hands-on exercise to practice safely preserving high-acid foods using the water bath canner.

All of the information and recommendations we will share with you today are based on the most recent *USDA Complete Guide to Home Canning (2009)*.

The National Center for Home Food Preservation at [http://www.nchfp.uga/edu](http://www.nchfp.uga/edu) is an additional resource for evidence-based food preservation materials.
A high percentage of water in most fresh foods makes them very perishable. They spoil or lose their quality for several reasons: growth of undesirable microorganisms like bacteria, molds, and yeasts; activity of food enzymes; reactions with oxygen; and moisture loss.

Through the process of canning, enzymes that can cause food to spoil are inactivated and oxygen is removed from the jar. Oxygen can cause food to lose quality.

When you process the food, air is driven from the jar. The heating and later cooling forms a vacuum seal which prevents air and the microorganisms it carries from re-entering the jars.

**Note:** The nutritional value of food is degraded by heat. If this is a concern, freezing produce is a better option. Tomatoes canned in a pressure canner are more nutritious than those processed in a water bath canner because of shorter processing times.

- The way to tell if a vacuum seal has formed is to look at the lids after cooling them for 12–24 hours.
- Press the center of the lid with your finger or thumb to see if the lid springs up when you release your finger. If properly sealed, the lid will not move.
- Look at the jar at eye level and see if it looks concave (curved down slightly in the center).
- Tap lid with a spoon and listen for a high-pitched ring.
Review the temperatures and their respective importance as displayed on the slide.

*Pg. 1-7; USDA Complete Guide to Home Canning*
*Pg. 10; So Easy to Preserve*
**pH is a measure of acidity.**

Don’t worry if you find pH values confusing; high-acid foods have low pH values and low-acid foods have high pH values. If your canning recipes come from a tested, credible source, the processing methods, times and temperatures have been determined for you.

High-acid foods can be safely processed in a water bath canner; low-acid food must be processed in a pressure canner.

*Pgs. 1-8, 1-9; USDA Complete Guide to Home Canning*  
*Pgs. 9, 46; So Easy To Preserve*
Select firm, just ripe (not quite table ready), unblemished produce. Wash well to reduce the microorganisms present on the skin of the produce. Peel the produce when the recipe indicates. Use the appropriate recipe, equipment and processing time for the food that you are canning.

Recommended Canning Practices

- Selecting and handling foods
- Tested recipe
- Equipment
- Processing
When you find a tested recipe, do not change it. Changing the recipe can make the product unsafe. A tested recipe has been lab-tested for time, temperature and pH.

The best source of instruction for home canning is recently published materials developed by USDA, Cooperative Extension Services at Land Grant universities, and major manufacturers of home canning equipment. Examples of tested recipes can be found in canning cookbooks such as Ball’s Home Guide to Food Preservation, So Easy to Preserve or recipes contained in pectin or other canning ingredients made by companies such as Mrs. Wages, Ball and Kerr (affiliated companies of Jardin Home brands www.jardinhomebrands.com). Some canning cookbooks contain recipes that are not tested. Check the introduction for safety recommendations or check with the publisher.

Avoid using outdated cookbooks (prior to 1997), internet blogs and untrustworthy websites. Cooking internet blogs are not credible sources unless the blog provides the source for the recipe. Untested recipes cannot be trusted as reliable or safe.

*Pg. 24; So Easy To Preserve*
Follow Tested Recipes

- Do not alter ingredients
  - Changes pH of food
- Do not add extra sugar or fat
- Do not add thickeners
- Do not change the size of food pieces

If you add extra sugar, fat, or thickeners like starch, rice or noodles, the tested process time is no longer accurate and safe.
With some foods processed in a water bath canner, it is necessary to add an acid to make them safe to eat. This should not be confused with adding a chemical called ascorbic acid that reduces browning.

Some foods such as tomatoes, call for the addition of an acid. Tested recipes will specify if it is necessary to add acid (vinegar or lemon juice). It is important that you use commercially bottled lemon juice and/or vinegar that is labeled 5% acidity. Any brand product may be used as long as it meets the recommended 5% acidity standard.

Using vinegar may change the flavor and/or color. Vinegar and citric acid can be substituted for lemon juice but not in the same amount.

Refer to *Pg. 50; So Easy To Preserve* or *Pg. 3-5; USDA Complete Guide to Home Canning* for specific instructions.
Some foods such as tomatoes and figs are usually considered high-acid foods. However, some tomato varieties are known to have a pH above 4.6. To ensure safe acidity in whole, crushed, or juiced tomatoes they must be acidified with lemon juice, or citric acid.

Figs also have pH values slightly above 4.6. If they are to be canned as acid foods they must also be acidified with lemon juice or citric acid.

Properly acidified tomatoes and figs can be safely processed in a boiling-water bath canner.

All home-canned Asian pears must be acidified before canning in a boiling-water bath canner to make them safe from the microorganisms that causes botulism.

**Processing Exceptions!**

**Tomatoes**

**Figs**

Pgs. 1-8, 1-9; Pg. 3-5; *USDA Complete Guide to Home Canning*
You will find ascorbic acid in pure powdered form, in vitamin C tablets and in commercial mixes designed to prevent browning. The ascorbic acid is usually added to the fruit after it is peeled and is waiting to be cooked or processed. Do not add it directly in the jars.

Vitamin C tablets should not contain additives.

Follow label and recipe directions.
There are three important points to remember from this session
1. Use the correct jars and lids,
2. Select the appropriate canner, and
3. Process the food for the correct amount of time.
Use only mason-type jars made by companies such as Ball, Kerr and Mason.

Half-pint jars are best for small amounts of jams and jellies.

Half-gallon jars are recommended only for high-acid juices because the jars are too large for heat to penetrate dense food products.

With careful handling, jars can be used many times, requiring only new lids. However, you will need to purchase new lids.
Jars, such as the one pictured on the left, with mouths that cannot be sealed with a two-piece canning lid, should not be used. They are for decorative purposes only. There are many old-style canning jars on the market, including some with zinc lids. None should be used for home food preservation.

Mayonnaise or other commercial jars also are not recommended. These jars have a narrower sealing surface and are less tempered than jars made specifically for canning; they will break in a pressure canner.

**Activity:**

Pass around examples of a commercial glass jar (mayonnaise, peanut butter or spaghetti sauce), a regular canning jar and canning lids. Have participants compare the width of the sealing surfaces with the width of the sealing compound on the lid. Point out that many commercial products are packaged in plastic versus the glass jars previously used.
Previously, it was recommended to sterilize all jars. Now, we know that if you are processing your product for more than 10 minutes, the jars are sterilized in the process. Jars used for jams, jellies, and pickled products processed less than 10 minutes must be sterilized. A dishwasher sterilization cycle is acceptable.

Jars will stay warm in an oven heated at 150-200° F. Do not take them out until you are ready to fill them. If the jars are allowed to cool, they may break when you pour hot product into them.
Buy only the lids that you will use in one year. The sealing compound can become dry if stored for long periods. Lids are only intended for onetime use.

A nick in the sealing compound may compromise your seal.

Similar to lids, the screw bands should be washed in hot, soapy water but they do not need to be held in simmering water. Metal screw bands can be re-used unless they are dented or rusty.

A sealed lid on your home preserved food product indicates that a vacuum has formed inside the jar.
Kits are available seasonally at stores and distributors that sell canning equipment (Wal-Mart, Southern States, Target, etc.).

Activity:
Show kit contents; all tools will be used during the hands-on activity.
Insert a spatula between the jar and food and move the spatula up and down while turning the jar to allow air bubbles to escape.

There is no need to release air bubbles in jams, jellies or other liquid foods such as juices.
Filling Jars

• Wipe rims of jars
• Place lids and rings on jar
• Tighten “fingertip” tight

• Unclean jar rims can interfere with seal.
• “Finger-tip” tight means to tighten just until you feel resistance.
• Do not over-tighten as this can cause the seal to fail and your lids to buckle. If rings are too tight, air cannot vent during processing and food will discolor during storage.
• Do not retighten lids after processing jars. This may cause your seal to break.
• Remove the screw bands after your jars have cooled; if left on the jars, they become difficult to remove and may rust.

Pg. 1-16; USDA Complete Guide to Home Canning.

Activity:
Have several practice jars with lids available for participants to practice “fingertip tight.”
Headspace is the unfilled space between the food and the jar lid. The space is needed for the expansion of food as the jars are processed and for forming the vacuum as jars cool. Typically, as the processing time increases, so does the amount of headspace. A tested recipe will specify the amount of headspace needed.

Headspace is important. If you have too much head space, it may take longer for the air to be driven out of the jar. If you have too little headspace, the jar may not seal.
Review the points on the slide.

Note: Tested recipes will specify the exact amount of time food should be heated for hot pack.

*Pg. 1-12; USDA Complete Guide to Home Canning*
When canning, your recipe may give you the option of hot or raw pack. When you have a choice, hot pack will yield a better product.

Always use the type of pack that is specified for each food. Many recipes only include hot pack directions.
Activity:
This slide is animated. Let participants guess the type of pack indicated by each picture. Mouse click again, and you will be able to see the titles of the picture.
Water bath canners are typically aluminum or porcelain-covered steel. The boiling water bath canner should have a fitted lid and removable rack (racks can be purchased separately). Do not use towels as racks; boiling water cannot circulate around them.

The canner must be deep enough that at least 1-2 inches of briskly boiling water will be over the tops of the jars during processing. Some boiling water bath canners do not have completely flat bottoms; these will not work well on smooth top or electric ranges. To ensure uniform processing of all jars on an electric range, the canner should be no more than 4 inches wider in diameter than the element on which it is heated (when centered on the burner or element, the canner should not extend over the edge of the burner or element by more than 2 inches on any side). Either flat or ridged bottom may be used on a gas burner.

Before water bath canning on a smooth cooktop, check the manufacturer’s advice on suitability for canning and recommended maximum canner size for specific burners.

http://nchfp.uga.edu/publications/nchfp/factsheets/smooothops.html

Pg. 1-18; USDA Complete Guide to Home Canning
During canning, jars should be kept upright. When the canner reaches a vigorous boil. When a vigorous boil is achieved, start processing time.

If the boil stops, you must bring the canner back to a vigorous boil and start the timing over from the beginning.

After your jars have boiled the required amount, you should turn off the heat, remove the lid, and wait 5 minutes before removing jars. Do not layer jars can in a water bath canner.
Review the steps for water bath canning.

Fill water bath canner and bring water to 140 to 180° F. Wash and sterilize canning jars and rings (if processing less than 10 minutes). Keep the jars warm until you fill them to prevent them from breaking when filled with hot product.

Prepare your recipe. When making jellied products make only one batch at a time. Fill jars leaving recommended headspace. Wipe the jar rim to remove any food that may interfere with a good seal. Add lid and screw band. Tighten “fingertip” tight. Process according to the recipe directions.
Before going to the kitchen, read aloud the recipe that you are using in today’s class from beginning to end.
Assign each participant a task such as washing, peeling or cutting food. Encourage everyone to pitch in with additional tasks as they complete their first assignment. Every participant should have at least one group task; everyone will fill a jar with product. This is the hands-on portion so it is important for everyone to be encouraged to fully participate. While jars are being processed, we will come back together to review the science behind home food preservation.

Note to instructor: Make sure all of the equipment needed for the canning activity is set out prior to the beginning of your workshop.
Review the points on the slide.

- Water bath canning
  - used for high-acid foods
  - water reaches 212°F, which kills molds, yeast and some bacteria
*Note: PSI = pounds per square inch of pressure

Though we’re not covering this topic today, it’s important to understand when it’s appropriate to use pressure canning.

A pressure canner must be used for low-acid foods because higher temperatures are needed to destroy clostridium botulinum spores.

Clostridium botulinum is present everywhere in the environment and is harmless except in low-acid, oxygen-free environments. Under these conditions, the bacterium grow and produce toxins dangerous to people and animals.

Low-acid foods such as vegetables, are not acidic enough to prevent clostridium botulinum bacteria from growing. These foods require processing under pressure, creating a temperature of at least 240° F.

**Pg. 6; So Easy To Preserve**

The acid environment created by high-acid foods such as fruits, prevents the clostridium botulinum spores from germinating, which is why fruit and tomatoes can be processed in a water bath canner.
Altitude matters. This is because water boils at a lower temperature in higher altitudes. Because the lower temperatures are less effective for killing bacteria, the processing time must be increased for water bath canning. For pressure canning, the pressure is increased.

Tested recipes will include information on necessary time adjustments for altitudes above 1,000 feet.

**Note to instructor: Know the altitude at your location.**
Open kettle canning refers to the practice in which hot food is put into hot jars and lids are attached, assuming that a vacuum is formed with no processing.

The inversion method calls for filling a hot jar with hot product and leaving \( \frac{1}{8} \) inch headspace. The lid is applied and the jar is inverted for five minutes, then turned upright. No processing is done to the jars and it is assumed that a vacuum is formed.

Note: Some very old recipes advocated adding powders or salicylic acid (aspirin) to each canning jar before processing. There is no evidence that doing so will prevent bacteria growth due to improper processing.
When you remove jars from canner, do not retighten lids. It may cause seal failure. Cool jars at room temperature for 12 to 24 hours. Remove screw bands and test seals. You cannot rush this process with ice, fans or cold water.

If the lid fails to seal on a jar, remove the lid and check the jar-sealing surface for tiny nicks. Change jar if necessary, add new lid and re-process within 24 hours, using the same processing time.
Review the points on the slide.

*Remove ring from sealed jar*
*Clean lid surface*
*Label and date jar*
*Store jars in a cool, dark, dry place*
*Avoid temperature extremes*
*Use within 1 year*

*Pg. 1-26; USDA Complete Guide to Home Canning*
DO NOT TASTE food from a jar with an unsealed lid or when food shows signs of spoilage.

Look for the following signs of spoilage in sealed jars:

1. While holding the jar upright at eye level, rotate the jar and examine its outside surface for streaks of dried food originating at the top of the jar.
2. Look at the contents for rising air bubbles and unnatural color.
3. When opening the jar, check for spurting liquid, smell for unnatural odors and look for cotton-like mold growth (white, blue-black or green) on top of the food surface and underside of lid.

Carefully discard any jar of spoiled food to prevent possible illness to you, your family, and pets. Before discarding, detoxify any jar of spoiled low-acid food by removing the jar lid, taking care not to spill the contents.

To detoxify, place jar, its contents and the lid in enough hot water to cover the jar. Boil for 30 minutes. Cool and discard all items.
Summary of Recommended Canning Practices

- Always use a tested recipe
- Use water bath canner for high-acid foods, pickles, jellies
- Use pressure canner for low-acid foods
- Use mason-type jars and self-sealing lids
- Process for specified time
- Don’t rush the process!

Review the points on the slide.
Credits

Adapted from:
- *So Easy to Preserve*, The University of Georgia Cooperative Extension, 2006.
- University of Georgia, National Center for Home Food Preservation

University of Maryland Extension Food Preservation Action Team
Writers: Lynn Little, Rebecca Davis, Dhruti Patel
Contributors and Reviewers: Liat Mackey, Terry Serio, Sandy Coridon, Donielle Axline

Graphic Design: Patricia Moore, David Hirner
Questions?
High-Acid Canning

Thank you for being here today!

Evaluation, wrap-up.
Welcome participants. Introduce yourself and ask everyone to make a name tent/tag.

**Write the following questions on a flip chart.**
- What's your favorite jam, jelly, etc.?
- What questions do you have about making jams and jellies?
- When making jams and jellies what problems have you experienced?
- What do you hope to learn today?

Take a few minutes to discuss participants’ responses.
Please give University of Maryland Extension credit for developing these materials.
Home food preservation is a science and an art. Today we will explore the science of food preservation, identify recommended safe food preservation practices and we will practice the process of safely preserving jams and jellies using the water bath canner.

All of the information and recommendations we will share with you today are based on the most recent *USDA Complete Guide to Home Canning*, 2009; and *So Easy to Preserve*, 2006.

For more information on home food preservation, visit the National Center for Home Food Preservation at [www.nchfp.uga.edu](http://www.nchfp.uga.edu)
Review the topics to be covered during the Jams and Jellies Workshop.

Overview

- Types of jellied products
- Ingredients used in jams and jellies
- Equipment and supplies
- Basic steps
Jelly, jam, preserves, conserves, and marmalades are basically alike. All are fruit products that are jellied or thickened to some extent. Most are preserved by sugar. Their individual characteristics depend on the kind of fruit used and the way it is prepared, the proportions of ingredients in the mixture and the method of cooking. The finished product will differ in clarity, color, consistency and flavor.

Activity:
Provide six samples of jellied products such as jelly, jam, marmalade, fruit butter, and preserves to taste and identify. You may want to include one sugar-free product for comparison. Have participants do a blind taste test. List all the sample products on a flip chart and have participants identify each.
Jelly is fruit juice held in clear gel. Jellies are usually made by cooking fruit juice with sugar. A good product is clear and firm enough to hold its shape. When cut, it should be tender yet retain the angle of the cut.

An uncooked jelly must be stored in the refrigerator or freezer.

*Pg..187; So Easy to Preserve*

*Pg.. 226; So Easy to Preserve – uncooked jelly recipes*
Jams

• Thick, sweet spreads
• Chopped or crushed fruit cooked with sugar (or use uncooked recipes)
• Hold shape, but less firm than jellies

Review points on slide

Pg..187; So Easy to Preserve
Pg.. 207; So Easy to Preserve – jam recipes
Review points on slide. Preserves are similar to jams except fruit is in larger pieces and has firm texture.

*Pg.s. 187-188; So Easy to Preserve*

*Pg.. 213; So Easy to Preserve - Preserves recipes*
Review points on slide.

**Note:**
when peeling citrus fruits for marmalades be sure to include some of the white membrane found just under the skin. This is where most of the pectin is located.

*Pg..188; So Easy to Preserve*

*Pg.. 217; So Easy to Preserve – marmalade recipes*
Conserves

- Similar to preserves
- Combination of two or more fruits cooked with sugar
- Add coconut, nuts, raisins

Review points on slide. Conserves have a consistency like jam. They are easily spreadable and not stiff. Conserves are often served with meat or poultry.

Note: Chutneys are not a conserve but are considered a pickled product.

Pg..188, Pg..163 chutney recipes; Pg.. 220 conserves recipes; So Easy to Preserve
Fruit butters are sweet spreads made by cooking fruit pulp with sugar to a thick consistency that will mound on a spoon.

Fruit honeys and syrups are made by cooking fruit juice or pulp with sugar to the consistency of honey. They will not hold their shape but will be pourable.

*Pg.s. 222–226; So Easy to Preserve* - butter, honeys and syrup recipes
Preserving Jelly Products Safely

- High sugar content
- Loss of water during cooking
- Acidity of products
- Processing in water bath

Jellied products are preserved because of their high sugar content. A large amount of sugar is added during preparation and water is lost during cooking. This makes water less available to microorganisms, such as molds and yeasts.

Molds and yeasts may grow in jellied products but can be destroyed by cooking and processing in a water bath canner.
In order to have a high-quality gel, there must be a proper balance of fruit, pectin, acid and sugar. Too much or too little of any of these four components can cause failure to gel properly.

*Pg..188; So Easy to Preserve*
Review the points on the slide.

**Note to Instructor:** This might be a good opportunity to invite your local Ag Marketing Specialist to share information regarding local producers and markets.
Review the points on the slide.

Washing produce before storing may promote bacterial growth and speed up spoilage. Wash fruits and vegetables just before using.
Fruit provides color and flavor, and at least part of the acid and pectin needed to form a gel. Fruit should be high quality, with no visible signs of spoilage. Because fully ripened fruit has less pectin, one-fourth of the fruit used in making jams and jellies without added pectin should be under-ripe.

Follow the ¼ to ¾ rule - use ¼ slightly under-ripe (which contain more pectin) and ¾ fully ripe fruit. Use fruit immediately and discard fruit that is over-ripe or spoiled.

If using frozen fruit, choose products with no added sugar. Frozen fruit is usually fully ripened, so pectin must be added to make jellied products. If you are freezing your own fruits for later use to make jams, jellies, etc., freeze with no added sugar.

Commercially frozen and canned juices can be used to make jelly but may be low in natural pectin and will make soft textured spreads.

As a general rule, when making jellies, approximately 1 lb. prepared (washed, trimmed, cut) fruit is equal to 1 cup juice.

Don’t soak fruit in water because it destroys flavor. Remove stems and blossoms.

When making jellies, do not peel or remove the cores or pits.

Cut into sizes indicated in recipe.

_Pgs 12, 188; So Easy to Preserve_
Pectin is the main ingredient responsible for gel. It occurs naturally in fruit. Some fruits have higher pectin than others especially in the peels, skins and cores. Heat will activate the pectin. The amount of pectin varies with the kind of fruit and its maturity.

Commercial pectin comes in both powder and liquid form, is widely available, and is typically made from apple or citrus fruits.

_Check your recipe and pectin directions – powdered and liquid pectins are not interchangeable in recipes._

_You will also find special modified pectins for jellied products made without sugar or less sugar than a regular recipe. Specific recipes and directions will be listed on the package insert._
Pectin can be used with any fruit. The advantages of adding pectin are that you can use fully ripe fruit, the cooking time is set and is shorter than recipes without pectin, and you get a greater yield from the same amount of fruit. You will likely have fresher fruit flavor; however, some flavor may be masked by the sugar. With added pectin jams and jellies will have better color and have less chance of failure.

Recipes without added pectin require a long boiling time. There is usually less added sugar but you will have concentrated natural sugars. These products tend to have loss of flavor from long boiling.
Modified pectin is available for reduced-sugar products that use no or less added sugar than regular recipes.

Follow the recipe on the package insert for the type of jelly or jam you want to make.
Pectin should be stored in a cool, dry place. It is best to buy the amount you will use in one season. Always check the “use-by” dates for the highest quality pectin.
The acid in fruits works with the pectin to form a gel and provides flavor. Under-ripe fruits have a higher acid level than riper fruits. Some recipes use added lemon juice or citric acid to increase the acidity.
The amount of pectin and acid naturally found in a fruit determines whether or not to add more pectin or acid. Some fruits do not require extra pectin or acid to form a good gel, provided they are not overripe. You can use this to determine what type of recipe to follow and fruit to choose. Some fruits produce a softer, less gelled product.

Other fruits may need additional pectin and/or acid to form a good gel.

Some fruits always need added acid, pectin or both.

*Pg.190; So Easy to Preserve*
There are some simple tests you can perform to see if your juice has enough natural pectin in it to make jelly without adding pectin.

*DO NOT TASTE THIS MIXTURE!*
Note to Instructor: This acid test is specifically for making jelly (not jams, preserves, etc.)

The amount of acid is also important. To test for acid, mix 1 teaspoon of lemon juice, 3 tablespoons of water and ½ teaspoon of sugar. Mix this thoroughly and taste it. Then taste your fruit juice. If your juice is at least equally tart, then it has enough acid to make jelly.

*Pg.195; So Easy to Preserve*
For jams, preserves, butters and marmalades without added pectin:

**Spoon or sheet test**
Dip a cool metal spoon into boiling jelly mixture. Lift the spoon out of the steam so the syrup runs off the side. When the mixture first starts to boil, the drops will be light and syrupy. As the syrup continues to boil, it will drop off the spoon two at a time. When the two drops form together and “sheet” off the spoon, the jellying point has been reached.

_Pg.196; So Easy to Preserve for diagram._

**Temperature**
Cook to 220° F, which is 8° F above the boiling point of water. Test thermometer for accuracy with boiling water prior to cooking jelly. For an accurate reading, place the thermometer in a vertical position and read at eye level. The bulb of the thermometer must be completely covered with the jelly but must not touch the bottom of the saucepot.

_Pg.195; So Easy to Preserve_

**Refrigerator/freezer test**
When you think the product has cooked long enough, place a small amount on a plate and put it in the freezer. After it has been in the freezer for a few minutes, check to see if it has formed a gel. If it has, it is ready. If not, you need to continue cooking. To avoid overcooking, take the batch off the stove during the test. If gel does not form, you will need to continue cooking the jelly.

_Pg.195; So Easy to Preserve_
Granulated white sugar is recommended unless the recipe specifies another type. Brown sugar and “raw” sugar are not recommended because they can affect the flavor, color and how well the product gels. If you want to use honey or corn syrup, use a tested recipe that specifies these ingredients. Sorghum and molasses are not recommended.

Superfine sugar can be used as a substitute – smaller grains dissolve quickly.

Never cut down on the amount of sugar called for in a recipe or it may not gel.

If you want to make low or no sugar jellied products, then you must use a modified pectin product or a recipe for low sugar spreads.

A frequently asked question is, “Can I just leave out some of the sugar in my recipe?” The answer is, No. IF YOU WANT TO MAKE LOW OR NO SUGAR JELLIED PRODUCTS, THEN YOU MUST BUY A SPECIAL TYPE OF PECTIN PRODUCT CALLED “LITE” OR “NO SUGAR NEEDED” PECTIN AND FOLLOW THE RECIPE AND DIRECTIONS ON THE PACKAGE INSERT OR USE A SPECIAL RECIPE FOR LOW SUGAR SPREADS.
Reducing the sugar in a recipe can result in a product that does not gel or will spoil at room temperature. Some pectins do not need sugar to gel; others need some sugar. Some pectins also give the option of using no sugar or less sugar with or without artificial sweeteners.

These products must be stored in the refrigerator and do not keep long. Some of the products made with these special recipes can be frozen.

Other recipes use unflavored gelatin, which thickens the product. Artificial sweeteners are often used in these recipes. These products also must be stored in the refrigerator and do not keep long.

Artificial sweeteners are often used in recipes that call for boiling fruit pulp for long periods until it resembles a jam, preserve or butter. These products must be processed in the water bath canner just like a regular jellied product.

Pgs. 228-230; So Easy to Preserve
The most common sugar substitutes are saccharin, aspartame, sucralose (Splenda), neotame, acesulfame potassium, stevia, sorbitol and xylitol.

Sugar substitutes have a different chemical nature from true sugar. They should be considered sweeteners only. They will not perform the other crucial functions of sugar in a recipe.

Splenda® can be used in jellied products, but it does not provide the sugar’s preservative properties. It is used for flavor as an optional sweetener in a jam or jelly with a no-sugar needed pectin. It can’t be used in long-boil recipes or no-pectin-added jams and jellies intended to be stored at room temperature.

_Pgs. 34-36; Putting Food By, 2010_
For a successful jellied product, you must have a proper ratio of fruit, pectin, acid and sugar. When you alter ingredients or their proportions, you may get a poor gel or no gel and mold will form.

Jelly should be made in small batches. Increasing batch size causes loss of flavor, darkening and toughening of jelly.

For best quality, prepare only the amount of jelly or jam that can be used in a few months. Jellied fruit products tend to lose flavor and color, and turn dark during storage.

*Pg. 233; So Easy to Preserve*
When you find a tested recipe, do not change it. Changing the recipe can make the product unsafe. A tested recipe has been lab-tested for time, temperature and pH.

The best source of instruction for home canning is recently published materials developed by USDA, Cooperative Extension Services at Land Grant universities, and major manufacturers of home canning equipment. Examples of tested recipes can be found in canning cookbooks such as *Ball’s Home Guide to Food Preservation*, *So Easy to Preserve* or recipes contained in pectin or other canning ingredients made by companies such as Mrs. Wages, Ball and Kerr (affiliated companies of Jardin Home brands [www.jardinhomebrands.com](http://www.jardinhomebrands.com)). Some canning cookbooks contain recipes that are not tested. Check the introduction for safety recommendations or check with the publisher.

Avoid using outdated cookbooks (prior to 1997), internet blogs and untrustworthy websites. Cooking internet blogs are not credible sources unless the blog provides the source for the recipe. Untested recipes cannot be trusted as reliable or safe.

*Pg. 24; So Easy to Preserve*
To make jellied products, you will need an 8 to 10-quart saucepot with a broad, flat bottom. You will need a jelly bag or cloth for extracting juice for jelly. You will also need jelly, candy or deep fat thermometer (long-boil method only). Boiling water-bath canner and ½ pint or pint Mason-type jars with two-piece lids.

To preserve the jams and jellies for shelf-stable storage, you will need a boiling water-bath canner and ½ pint or pint Mason-type jars with two-piece lids.
These kits are available seasonally at stores and distributors that sell canning equipment (Wal-Mart, Southern States, Target, etc.).

**Activity:**

Show kit contents and describe how each tool is used. All tools will be used during the hands-on portion of the workshop.
Jars used for jams, jellies processed less than 10 minutes must be sterilized. To sterilize jars boil jars for 10 minutes; boiling one additional minute for each 1000 feet of additional altitude above 1000 feet. Jars will stay warm in an oven heated to 150-200°F and need to be kept hot until ready to fill with product. If the jars are allowed to cool, they may break when you pour hot product into them. A dishwasher sterilization cycle is also acceptable.
Jars, such as the one pictured on the left, with mouths that cannot be sealed with a two-piece canning lid, should not be used. They are for decorative purposes only. There are many old-style canning jars on the market, including some with zinc lids. None should be used for home food preservation.

Mayonnaise or other commercial jars also are not recommended. These jars have a narrower sealing surface and are less tempered than jars made specifically for canning; they will break in a pressure canner.

Activity:
Pass around examples of a commercial glass jar (mayonnaise, peanut butter or spaghetti sauce), a regular canning jar and canning lids. Ask participants to compare the width of the sealing surfaces with the width of the sealing compound on the lid. Point out that many commercial products are packaged in plastic versus the glass jars previously used.
Buy only the lids that you will use in one year. The sealing compound can become dry if stored for long periods. Lids are only intended for onetime use.

A nick in the sealing compound may compromise your seal.

Similar to lids, the screw bands should be washed in hot, soapy water but they do not need to be held in simmering water. Metal screw bands can be re-used unless they are dented or rusty.

A sealed lid on your home preserved food product indicates that a vacuum has formed inside the jar.
Water bath canners are typically aluminum or porcelain-covered steel. The boiling water bath canner should have a fitted lid and removable rack (racks can be purchased separately). Do not use towels as racks; boiling water cannot circulate around them.

The canner must be deep enough that at least 1-2 inches of briskly boiling water will be over the tops of the jars during processing. Some boiling water bath canners do not have completely flat bottoms; these will not work well on smooth top or electric ranges. To ensure uniform processing of all jars on an electric range, the canner should be no more than 4 inches wider in diameter than the element on which it is heated (when centered on the burner or element, the canner should not extend over the edge of the burner or element by more than 2 inches on any side). Either flat or ridged bottom may be used on a gas burner.

Before water bath canning on a smooth cooktop, check the manufacturer’s advice on suitability for canning and recommended maximum canner size for specific burners.
http://nchfp.uga.edu/publications/nchfp/factsheets/smoothtops.html

Pg.1-18; USDA Complete Guide to Home Canning
Prepare your recipe. When making jellied products, make only one batch at a time and boil rapidly. Long, slow boiling can destroy the pectin and leads to a poor gel. Skim foam if necessary.
Filling the Jars

- Ladle the hot jam into the warm jars, leaving $\frac{1}{4}$ inch headspace.

Review the slide.
Headspace is the unfilled space between the food and the jar lid.

The space is needed for the expansion of food as the jars are processed and for forming the vacuum as jars cool. Typically, as the processing time increases, so does the amount of headspace. A tested recipe will specify the amount of headspace needed.

Headspace is important. If you have too much headspace, it may take longer for the air to be driven out of the jar. If you have too little headspace, the jar may not seal.

Pg.26; So Easy to Preserve
Pg.1-13; USDA Complete Guide to Home Canning
Review note on slide. This will ensure that none of the jelly/jam gets left on the sealing surface and interferes with proper sealing of the lid.

*Pgs.1-15 to 1-16; USDA Complete Guide to Home Canning.*
Review the slide.

- fingertip tight means to tighten just until you feel resistance.
- Do not over-tighten since this can cause the seal to fail and your lids to buckle. If rings are too tight, air cannot vent during processing and food will discolor during storage.
- Do not retighten lids after processing jars. This may cause your seal to break.
- Remove the screw bands after your jars have cooled; if left on jars, they become difficult to remove and may rust.

Pg.1-16; USDA Complete Guide to Home Canning

Activity:
Have several practice jars with lids available for participants to practice “fingertip tight.”
Processing the Jam

• Using a jar lifter, place the jars on the rack in the boiling water canner, being careful not to tilt the jars.
• The water in the canner should be simmering (180°F) before adding jars.

Review the points on the slide.
During canning, jars should be kept upright. Begin counting the time for processing when the canner reaches a vigorous boil. Do not start counting time for processing until the water in the canner reaches a vigorous boil.

If the boil stops, you must bring the canner back to a vigorous boil and start the timing over.

After your jars have boiled the required amount, you should turn off the heat, remove the lid, and wait 5 minutes before removing jars.

Jars should not be layered in a water bath canner.

*Pg.1-18; USDA Complete Guide to Home Canning
Pgs. 27-28; So Easy to Preserve*
Remember…

Each food has its own processing time, and that time may differ with the size of the jar. Follow the directions carefully for the size of the jar you are using! If you process too little, the food can spoil and in some cases, may be unsafe.

Canning destroys potential pathogens that could make food unsafe; it stops enzymes that contribute to changes in color and ripening.
Altitude matters. Water boils at a lower temperature in higher altitudes, so it is necessary to increase the processing time because lower temperatures are less effective in killing bacteria.

*Pg.31; So Easy to Preserve*

Tested recipes will include information on necessary pressure adjustments for altitudes above 1,000 feet.

**Note to instructor: Know the altitude at your location.**
Not Recommended

- Open kettle canning
- Microwave canning
- Dishwasher canning
- Oven canning
- Steam canning
- Slow cookers, powders
- Inversion method

**Pgs.18-19; So Easy to Preserve**
Open kettle canning refers to the practice of putting hot food into hot jars and lids are attached, assuming that a vacuum is formed with no processing.

**Pgs. 286-287; Putting Food By, 2010**
The inversion method calls for filling a hot jar with hot product and leaving 1/8th inch headspace. The lid is applied and the jar is inverted for five minutes, then turned upright. No processing is done to the jars and it is assumed that a vacuum is formed.

**Note:** Some very old recipes advocated adding powders or salicylic acid (aspirin) to each canning jar before processing. There is no evidence that doing so will prevent bacteria growth due to improper processing.
For many years, paraffin has been used to seal jellied products. Although you will still find paraffin sold with canning supplies, it is no longer recommended.

Paraffin or wax sealing of jars is not considered an acceptable choice because any pinholes, shrinkage or cracks in the wax paraffin, allow airborne molds to contaminate and grow on the product. In addition, leaks or holes in the paraffin can allow product to seep out during storage. Once on the surface, this seeping product will provide nutrients for molds to grow on the surface and enter into the jam or jelly in the jar. Without proper processing, mold can grow under the paraffin and grow into the product.
Review the points on the slide.

- Using the jar lifter, remove the jars from the canner, again without tilting, and set them on a clean towel, or plastic or wooden cutting board to cool away from drafts.
Before going to the kitchen, read aloud the recipe that you are using in today’s class from beginning to end. Assign each participant a task such as washing, peeling or cutting food. Encourage everyone to pitch in with additional tasks as they complete their first assignment. Each participant should have at least one group task; everyone will fill a jar with product. This is the hands-on portion so it is important to encourage everyone to fully participate. While jars are being processed, come back together to review additional important information about home food preservation.

Note to instructor: Make sure all of the equipment needed for the canning activity is set out prior to the beginning of your workshop.
Allow jars to sit for 12 to 24 hours before their seals are checked, or before they are stored or opened.

Remove ring bands from the sealed jars. Wash and dry the sealing area and threads of the jar. Store jars without ring bands in a cool, dark, dry place.

Store unsealed jars in the refrigerator.

Checking the Seals

- Allow jars to sit for 12 to 24 hours
- Store jars without ring bands in a cool, dark, dry place.
- Store unsealed jars in the refrigerator.

Allow jars to sit for 12 to 24 hours before their seals are checked, or before they are stored or opened.

Remove ring bands from the sealed jars. Wash and dry the sealing area and threads of the jar. Store jars without ring bands in a cool, dark, dry place.

Store unsealed jars in the refrigerator.
How do you test to see that jars are sealed?

There are three ways:
1) Listen for a popping sound as jars begin to cool.
2) The lids will curve down or inward toward the jar and will not move when pressed.
3) If you tap on the center of the top with a metal spoon, you will hear a clear ringing sound rather than a dull thud.

Activity:
Have some sealed and unsealed jars of food. Let participants practice checking for seals.
Storing canned foods

*Pg.1-26; USDA Complete Guide to Home Canning*
DO NOT TASTE food from a jar with an unsealed lid or when food shows signs of spoilage.

Look for the following signs of spoilage in sealed jars:

1. While holding the jar upright at eye level, rotate the jar and examine its outside surface for streaks of dried food originating at the top of the jar.
2. Look at the contents for rising air bubbles and unnatural color.
3. When opening the jar, check for spurting liquid, smell for unnatural odors and look for cotton-like mold growth (white, blue-black or green) on top of the food surface and underside of lid.

Carefully discard any jar of spoiled food to prevent possible illness to you, your family, and pets. Before discarding, detoxify any jar of spoiled low-acid food by removing the jar lid, taking care not to spill the contents.

To detoxify, place jar, its contents and the lid in enough hot water to cover the jar. Boil for 30 minutes. Cool and discard all items.

*Pgs. 32-34; So Easy to Preserve*
Jam and Jelly Best Practices

- Use good-quality fruit, most should be just ripe
- Wash fruit, do not soak
- Remove stems and blossoms
- Do not remove skins, cores, or pits as they have a high pectin concentration
- Cut into size pieces specified in recipe
- Cook until fruit is soft – do not overcook

Review points on slide. Do not remove skins, cores or pits as these contain high pectin concentrations necessary to help the gelling process for jelly.

Be careful not to overcook. Overcooking destroys pectin, color and flavor.
For a successful product, follow tested recipes and do not alter the recipe. If you are making a low-sugar or no-sugar product, follow procedures and don’t just reduce sugar. Use good-quality fruit, most should be just ripe. Process in a water bath canner and use products within a year for best quality.
There are remedies for many of the problems associated with jams and jellies.

Refer participants to *Pg.s 232-237; So Easy to Preserve* for solutions to many of the common problems some of which are listed on the slide.

**Activity:**
Using the chart on pages 234-237 of *So Easy to Preserve* as a reference, list a variety of problems encountered when making jellied products on index cards. Hand out one card to each person and ask them to research the problem, the causes and the remedies. This can be done individually and/or in small groups. Have everyone report their findings to the entire group. This exercise can help participants become more familiar with the contents of their resource book *So Easy to Preserve*.

**Activity:**
Write the following scenarios on index cards and ask for volunteers to read each one. After reading aloud, ask participants to spend about 3-5 minutes discussing with the person next to them what was done correctly/incorrectly and how the problem can be remedied, if necessary. Share responses.

1. Auntie Mamie is preparing her famous apple jelly recipe from *So Easy to Preserve*. She pours the jelly into 6 sterilized jars, using all recommended canning procedures. She has enough left over for an additional jar. She washes a new jar in hot soapy water and pours the rest of the jelly into the jar. She has just enough jelly for the additional jar, leaving ¼ inch headspace. The processing time for this recipe is 12 minutes. Is Auntie Mamie’s last jar of jelly safe to eat? Why or why not?

   **Answer:** Yes, it is safe to eat. The jar was washed according to recommendations and the processing time is greater than 10 minutes so the jar will be sterilized during the canning process.
2. Mr. Andrews has a large garden. This year, he has a bumper crop of green beans and today he has decided to can a dozen pint jars of beans. He blanches his beans and pours them into 7 pint jars in his water-bath canner. He sets the timer for 40 minutes. Is he following the correct procedure? Why or why not?

**Answer:** No, he is not following the correct procedure and his beans will not be safe to eat. Beans are a low-acid food and MUST be canned in the pressure canner. If he followed a tested recipe, it would specify that green beans must be pressure canned.

3. Sally is diabetic. She has decided to make strawberry jam using her own recipe that requires half of the sugar of the recipe from *So Easy to Preserve*, which calls for only sugar and strawberries. She is freezing her jam. Will the product be safe? What would you recommend as an alternative to Sally’s method?

**Answer:** As long as Sally freezes her jam, it will be safe to eat; however, the jam will most likely be very runny because sugar is a necessary part of the gelling process. If Sally wants to reduce the sugar in her jam, she could use a recipe for strawberry jam with pectin and artificial sweetener.
Some people like to make freezer jams because they think it tastes more like fresh fruit. There are newer pectin products on the market made specifically for freezer jams. They are simple to use, and call for no sugar or less sugar than a regular recipe.
If you make a freezer jam, follow these guidelines for storing the product.

**Storing Freezer Jam**

- DO NOT store at room temperature - will mold and/or ferment.
- Freezer storage best for color and flavor retention.
- Do not place in freezer until gel forms.
- Must be stored in refrigerator or freezer.
- May be stored in refrigerator up to 3 weeks; in freezer up to 1 year.
Credits

Adapted from:
- USDA Home Canning Guide #6 (2009)
- So Easy to Preserve text (5th edition 2006)
- University of Georgia, National Center for Home Food Preservation
- Putting Food By, Janet Greene, Ruth Hertzberg, and Beatrice Vaughan, Penguin Group, 2010

University of Maryland Extension Food Preservation Action Team
Writers: Lynn Little, Rebecca Davis, Dhruti Patel
Contributors and Reviewers: Liat Mackey, Terry Serio, Sandy Coridon, Donielle Axline

Graphic Design: Patricia Moore, David Hirner
Questions?
Evaluation, wrap-up.
Welcome participants. Introduce yourself and ask everyone to make a name tent/tag.

This session covers how to preserve acidified foods such as cucumber pickles, fruits, relishes, salsa and chutney using USDA recommended procedures.

**Introductory Activity:**
Welcome the participants and ask volunteers to describe any experience with making or eating pickled foods. What are some of their favorite pickled foods? What questions do they have about making pickled foods? What do they hope to learn by attending the session?
Please give University of Maryland Extension credit for developing these materials.
Objectives

- Describe the processes for preserving acidified foods.
- Identify the ingredients and equipment recommended for pickling.
- Process a pickled product in the water bath canner.

Review the points on the slide.
Review the topics to be covered in the Pickled Products Workshop.

Overview

• Types of pickled products
• Ingredients used in pickled products
• Equipment and supplies
• Basic steps
Pickles

<table>
<thead>
<tr>
<th>Brined or fermented pickles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergo a curing process in brine (salt and water solution) overnight or held for several weeks</td>
</tr>
<tr>
<td>Acid is either added (vinegar) or created by fermentation (lactic acid)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fresh-pack or quick-process pickles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes brined for a few hours</td>
</tr>
<tr>
<td>Covered with boiling hot vinegar, spices and seasonings (adding an acid)</td>
</tr>
</tbody>
</table>

There are two types of pickles: brined or fermented and fresh-pack or quick-process. The brining or “curing” process can be short (overnight) or may be as long as several weeks, which leads to fermentation. The brine is made up of water and salt. The curing or brining process changes the color, texture and flavor of the pickle.

If you are using a short-brine recipe, an acid (vinegar) is added to help preserve the food.

If your recipe is for a fermented product, lactic acid is produced during the brining process, which helps preserve the product.

Fresh-pack or quick-process pickles are popular due to their comparative ease of preparation. They are covered in boiling hot vinegar, spices, and seasonings. They are usually brined for several hours and then drained before they are covered with the pickling liquid. These pickles have a tart flavor.

The vinegar added during the brining process or the lactic acid produced during fermentation reduces the pH (increasing the acidity) of cucumbers, making the pickles an acid food that can be safely processed in the water bath canner.

*Pg. 117; So Easy to Preserve*
Other Pickled Products

- Fruit pickles
  - Whole or sliced fruits
  - Simmered in a spicy, sweet-sour syrup made with vinegar or lemon juice
- Relishes and chutneys
  - Chopped fruits and vegetables
  - Cooked in a spicy vinegar solution

There also are fruit pickles made with whole or sliced fruits that are simmered in spicy, sweet-sour syrup made with vinegar or lemon juice.

Relishes are made from chopped fruits and vegetables cooked in a spicy vinegar solution.

Pg. 118; So Easy to Preserve

Chutney is a relish-type condiment that can be made with several different combinations of foods. Ingredients may include herbs such as cilantro or mint; a flavoring ingredient such as coconut, onion, ginger, or tamarind; chopped fruits or vegetables, simmered with spices, onion, sugar and vinegar.

For more information on chutneys, visit: [http://nchfp.uga.edu/how/can_06/chutney_principles.html](http://nchfp.uga.edu/how/can_06/chutney_principles.html)
Vinegar increases the acidity of the food, lowering pH and serving as a preservative.

Salt, used in brining pickles, is a preservative. Brine draws moisture and natural sugars from foods and forms lactic acid which keeps them from spoiling.

Canning prevents the growth of microorganisms that cause spoilage and illness. By adding acid to the mixture, one can safely water bath process vegetables (a naturally low-acid food).

_Pg. 31; Putting Food By, 2010_
Review the points on the slide.

Pickle products are subject to spoilage from microorganisms, particularly yeasts and molds, as well as enzymes that may affect flavor, color and texture. Processing the pickles in a boiling water canner will prevent both of these problems. Standard canning jars and self-sealing lids are recommended. Processing times and procedures will vary according to food acidity and the size of food pieces.
Review the points on the slide.

Low-temperature pasteurization results in a better product texture but must be carefully managed to avoid possible spoilage. You only use this treatment if the recipe provides the option.

Steps in this procedure require that you pack the room temperature product in a jar and pour 165–180°F liquid over the product, leaving the appropriate headspace. Remove air bubbles, wipe jar rims, adjust lids and process for 30 minutes at 180°F.

Use a thermometer because temperature is hard to determine without one. If product is not processed at the proper temperature, spoilage could result.

*Pg. 122; So Easy to Preserve*
*Pg. 6-5; USDA Guide to Home Canning*
Pickling Ingredients

- Produce
- Salt
- Vinegar
- Sugar
- Spices
- Water
- Firming agents

Each ingredient will be discussed individually on following slides.
Review the points on the slide.

**Note to Instructors:** This might be a good opportunity to invite your local Ag Marketing Specialist to share information regarding local producers and markets.
Review the points on the slide.

Washing produce before storing may promote bacterial growth and speed up spoilage. Wash fruits and vegetables just before using.
Review the points on the slide.

Cucumbers lose moisture quickly so even one day at room temperature may lead to hollow-centered or shriveled pickles.

Cucumbers should be the pickling variety rather than table or slicing cucumbers. Avoid waxed cucumbers since the wax makes it difficult for brine and pickling solutions to penetrate.

You will need approximately 14 pounds of cucumbers for 7 quarts or 9 pounds for 9 pints. A bushel of cucumbers weighs 48 pounds and yields 16-24 quarts, an average of 2 pounds per quart.

Measure or weigh the amounts of food carefully because the proportion of fresh produce to other ingredients will affect flavor and safety of the final product.

Buy cucumbers in a size suitable for the recipe (1 ½ inch for gherkins and 4-inch for dills). Use more mature and odd-shaped cucumbers for relishes and bread-and-butter style pickles.

Wash the produce well. Do not use any foods that have signs of mold, even the slightest bit. Mold can produce an off-flavor that processing does not destroy.

*Pg. 12-13; So Easy to Preserve - weights and yields of produce*
Cut off about 1/16-inch slice from the blossom end of the cucumber since it contains enzymes that can cause softening.
Use pure granulated salt often called pickling or canning salt. This is usually found in the canning section of the grocery, hardware or farm supply stores. Table salt contains additives, such as anti-caking agents and iodine. The anti-caking additive causes the pickling liquid to become cloudy and leaves sediment in the jar; iodine will darken and discolor the pickles.

Kosher salt comes in granules coarser than table salt but is more common as flaked salt. Kosher salt is suitable for canning because it will not cloud the liquid and iodine is never added. Flaked kosher salt is less dense than regular canning salt and therefore, measures differently.

Pgs. 30-31; Putting Food By, 2010

Solar or sea salt contains minerals that could interfere with fermenting or curing processes.

Rock salt and other salts used for clearing roads and sidewalks are not food grade.

Salt used in brining pickles is a preservative and is also important for fermentation of pickles and sauerkraut. Always use the correct proportions of salt and other ingredients. Follow a tested recipe.

Recipes are available for making reduced-sodium dill pickles and sweet pickles.

Pg. 168; So Easy to Preserve
The acidity of the vinegar is important for safety, and a weak (low acidity) vinegar can make pickles soft or slippery. Use vinegars of 5% acidity or greater. This is the acidity of many commercial vinegars but always check the label to be sure. Never dilute the vinegar. Avoid homemade vinegar or vinegars of unknown acidity.

Vinegar can affect the color of your product. Use white vinegar for onions, cauliflower or pears or whenever you want the liquid to be clear.

The level of acidity in a pickled or fermented product is as important for safety, taste and texture. Do not alter vinegar, food or water proportions in a recipe. Use only recipes with tested proportions of ingredients.

If you decide the recipe is too tart, you can add sugar. Use ¼ cup white sugar for every 4 cups of vinegar in the recipe. This amount will not affect the safety of the recipe.

_Pg.318; Putting Food By, 2010_

Avoid boiling any canning vinegar solution for a long time. The acetic acid in vinegar is volatile and it will lose its ability to keep stored pickles safe.

_Pg. 316; Putting Food By, 2010_
In addition to flavor, sugar helps to keep pickles plump and firm. If you use a sugar substitute, use a recipe developed specifically for the sugar substitute. Sugar substitutes are not usually recommended in pickling because heat and/or storage may cause bitterness or loss of flavor.
Fresh, whole spices offer the best quality and flavor in pickles. Powdered spices can cause a darker and cloudier product. For lighter color pickling liquid, tie whole spices loosely in a clean white cloth or cheesecloth bag, removing the bag from the pickling liquid before packing the jars.

Buy fresh spices for each pickling season. Spices deteriorate and lose their pungency in heat and humidity, so they should be kept in airtight containers in a cool place.

What if you don’t have the type of dill your recipe calls for? For each quart, try 3 heads of fresh dill, 1 to 2 tablespoons dill seed or 2 tablespoons dill weed.

_Pg.182; So Easy to Preserve_

Over-mature dill may cause pickles to turn pink, but the product may still be safe. However, yeast growth could also cause this color change. If yeast growth is evident, discard the pickles. Yeast growth may also make the pickles cloudy or slimy.

_Pg.119; So Easy to Preserve_
Always use potable water that is safe to drink. Hard water can interfere with the formation of acid and prevent pickles from curing properly. It also can make dark or discolored pickles. You can soften water by boiling it for 15 minutes and letting it sit for 24 hours. Any scum that appears should be removed. Distilled water is another option.

Water with above-average calcium content can shrivel pickles, and iron compounds can make them darker than normal.
Food scales are recommended for pickling because it is important to follow recipes to ensure you are using the correct proportions of produce to salt and vinegar as specified in the tested recipe.
Review the points on the slide.

Copper, brass, galvanized or iron pots and utensils should not be used because the metals can react with acids or salts in pickles and cause undesirable color changes.
When you find a tested recipe, do not change it. Changing the recipe can make the product unsafe. A tested recipe has been lab-tested for time, temperature and pH.

The best source of instruction for home canning is recently published materials developed by USDA, Cooperative Extension Services at Land Grant universities, and major manufacturers of home canning equipment. Examples of tested recipes can be found in canning cookbooks such as *Ball’s Home Guide to Food Preservation, So Easy to Preserve* or recipes contained in pectin or other canning ingredients made by companies such as Mrs. Wages, Ball and Kerr (affiliated companies of Jardin Home brands [www.jardinhomebrands.com](http://www.jardinhomebrands.com)). Some canning cookbooks contain recipes that are not tested. Check the introduction for safety recommendations or check with the publisher.

Avoid using cookbooks published prior to 1997, internet blogs and untrustworthy websites. Cooking internet blogs are not credible sources unless the blog provides the source for the recipe. Untested recipes cannot be trusted as reliable or safe.
Pg.24; So Easy to Preserve
These kits are available seasonally at stores and distributors that sell canning equipment (Wal-Mart, Southern States, Target, etc.).

**Activity:**
Show kit contents and describe how each tool is used. All tools will be used during the hands-on portion of the workshop.
Water bath canners are typically aluminum or porcelain-covered steel. The boiling water bath canner should have a fitted lid and removable rack (racks can be purchased separately). Do not use towels as racks; boiling water cannot circulate around them.

The canner must be deep enough that at least 1-2 inches of briskly boiling water will be over the tops of the jars during processing. Some boiling water bath canners do not have completely flat bottoms; these will not work well on smooth top or electric ranges. To ensure uniform processing of all jars on an electric range, the canner should be no more than 4 inches wider in diameter than the element on which it is heated (when centered on the burner or element, the canner should not extend over the edge of the burner or element by more than 2 inches on any side). Either flat or ridged bottom canners may be used on a gas burner.

Before water bath canning on a smooth cooktop, check the manufacturer’s advice on suitability for canning and recommended maximum canner size for specific burners.

http://nchfp.uga.edu/publications/nchfp/factsheets/smoothtops.html

Pg.1-18; USDA Complete Guide to Home Canning
Previously, it was recommended to sterilize all jars. Now, we know that if you are processing your product for more than 10 minutes, the jars are sterilized in the process. Jars used for pickled products processed less than 10 minutes must be sterilized. A dishwasher sterilization cycle is acceptable.

Jars will stay warm in an oven heated at 150-200° F. Do not take them out until you are ready to fill them. If the jars are allowed to cool, they may break when you pour hot product into them.
Jars, such as the one pictured on the left, with mouths that cannot be sealed with a two-piece canning lid, should not be used. They are for decorative purposes only. There are many old-style canning jars on the market including some with zinc lids. None should be used for home food preservation.

Mayonnaise or other commercial jars also are not recommended. These jars have a narrower sealing surface and are less tempered than jars made specifically for canning; they will break in a pressure canner.

**Activity:**

Pass around examples of a commercial glass jar (mayonnaise, peanut butter or spaghetti sauce), a regular canning jar and canning lids. Ask participants to compare the width of the sealing surfaces with the width of the sealing compound on the lid. Point out that many commercial products are packaged in plastic versus the glass jars previously used.
Buy only the lids that you will use in one year. The sealing compound can become dry if stored for long periods. Lids are only intended for one-time use.

A nick in the sealing compound may compromise your seal.

Similar to lids, the screw bands should be washed in hot, soapy water but they do not need to be held in simmering water. Metal screw bands can be re-used unless they are dented or rusty.

A sealed lid on your home.preserved food product indicates that a vacuum has formed inside the jar.
Review the points on the slide.

- Fill clean jars with product adding liquid as specified in recipe.
- Leave ½ inch headspace.
- Release air bubbles in jar with plastic spatula.
Headspace is the unfilled space between the food and the jar lid.

The space is needed for the expansion of food as the jars are processed and for forming the vacuum as jars cool. Typically, as the processing time increases, so does the amount of headspace. A tested recipe will specify the amount of headspace needed.

Headspace is important. If you have too much headspace, it may take longer for the air to be driven out of the jar. If you have too little headspace, the jar may not seal.
Filling the Jars

- Wipe the jar rims using a clean, damp cloth or paper towel.

This will ensure that none of the product gets left on the sealing surface and interferes with the lid sealing properly.
Review the points on the slide.

- Finger-tip tight means to tighten just until you feel resistance.
- Do not over-tighten as this can cause the seal to fail and your lids to buckle. If rings are too tight, air cannot vent during processing and food will discolor during storage.
- Do not retighten lids after processing the jars. This may cause your seal to break.
- Remove the screw bands after your jars have cooled; if left on jars, they become difficult to remove and may rust.

_Pg.1-16; USDA Complete Guide to Home Canning_

**Activity:**
Have several practice jars with lids available for participants to practice “finger-tip tight.”
Review the points on the slide.

- Using a jar lifter, place the jars on the rack in the boiling water canner, being careful not to tilt the jars.
- The water in the canner should be simmering (180°F) before adding jars.
Remember…
Each food has its own processing time that differs with the size of the jar. Follow the directions carefully for the size of the jar you are using! If you process too little time, the food can spoil and in some cases, may be unsafe.

Canning interrupts Mother Nature by destroying potential pathogens (harmful bacteria) that could make food unsafe. Canning stops enzymes that contribute to changes in ripening and color.
Before going to the kitchen, read aloud the recipe that you are using in today’s class from beginning to end.

Assign each participant a task. Encourage everyone to pitch in with additional tasks as they complete their first assignment. Every participant should have at least one group task; everyone will fill a jar with product.

This is the hands-on portion so it is important for everyone to be encouraged to fully participate.

While jars are being processed, we will come back together to review the science behind home food preservation.

**Note to instructor:** Make sure all of the equipment needed for the canning Activity: is set out prior to the beginning of your workshop.
Although many people think that crisp, firm pickles require the use of lime or alum, firming agents are not necessary and can affect pickle safety. It is safer to start with good quality produce and follow recommendations from USDA and other reliable sources. Soaking cucumbers in ice and water for 4-5 hours can help with pickle firmness, as will slicing off 1/16-inch from the blossom end of the cucumber.

**Note to Instructor:** Alum is a compound used in old recipes to make pickles crisp. It is no longer recommended. If ingested in large quantities, it can produce nausea or severe gastrointestinal distress.

*Pg. 319; Putting Food By, 2010*
*Pg.120; So Easy to Preserve*
Lime is a firming agent that contains calcium. It can improve firmness but is not necessary. If used incorrectly, lime can be unsafe. If you do use lime, use food-grade pickling lime, not agricultural or burnt lime. Soak the cucumbers in lime-water solution for 12-24 hours before pickling.

Remove excess lime by draining the lime-water solution, rinse and then soak the cucumbers for one hour in fresh water. Repeat the rinsing and soaking steps two more times. The rinsing process is very important because excess lime absorbed by the cucumbers can make pickles unsafe to eat and may increase the risk of botulism.

Avoid inhaling the lime dust.

*Pg.120; So Easy to Preserve*
Review the points on the slide.

Keep food submerged 1-2 inches under the brine when fermenting. Use a dinner plate or glass pie plate inside the container. You can weigh the plate down with a glass jar filled with water. You can also use food-grade freezer bags, placing one bag inside another. Fill the inner bag with extra brine and use as a weight on top of the vegetables.

*Pg.121; So Easy to Preserve*
Pickling Best Practices

1. Use high-quality, fresh produce
2. Wash and discard moldy produce
3. Use within 24 hours after harvesting
4. Use tested recipes
5. Do not alter ingredient proportions
6. Use vinegar with 5% acidity
7. Use recommended equipment and utensils
8. Follow water bath canning procedures.

Review the points on the slide.
Altitude matters. Water boils at a lower temperature in higher altitudes. Because the lower temperatures are less effective for killing bacteria, the processing time must be increased for water bath canning. For pressure canning, the pressure is increased.

*Pg.31; So Easy to Preserve*

Tested recipes will include information on necessary time adjustments for altitudes above 1,000 feet.

**Note to instructor:** Know the altitude at your location.
Open kettle canning refers to the practice of putting hot food into hot jars and lids are attached, assuming that a vacuum is formed with no processing.

The inversion method calls for filling a hot jar with hot product and leaving 1/8th inch headspace. The lid is applied and the jar is inverted for five minutes, then turned upright. No processing is done to the jars and it is assumed that a vacuum is formed.

Note: Some very old recipes advocated adding powders or salicylic acid (aspirin) to each canning jar before processing. There is no evidence that doing so will prevent bacteria growth due to improper processing.
Cooling the Jars

- Using the jar lifter, remove the jars from the canner, without tilting, and set them on a clean towel, or plastic or wooden cutting board to cool away from drafts.

Review the points on the slide.
Allow jars to sit for 12 to 24 hours before their seals are checked, or before they are stored or opened.

Remove ring bands from the sealed jars. Wash and dry the sealing area and threads of the jar. Store jars without ring bands in a cool, dark, dry place.

If you have unsealed jars, you can reprocess by dumping the contents into large cooking pot and bring to a boil. Once boiling, you can pack into hot canning jars, add new lids and process again in the water bath canner for the required time.

Another option is to store unsealed jars in the refrigerator and use within the next week.

*Pg.321; Putting Food By, 2010*
Through the process of canning, enzymes which can cause food to spoil are inactivated and oxygen is removed from the jar. Oxygen can cause food to lose quality.

Heating and cooling during the canning process forms a vacuum in the jars which keeps liquid in and air and microorganisms out.

How do you test to see that jars are sealed?

There are basically three ways:
1) Listen for a popping sound as jars begin to cool.
2) The lids will curve down or inward toward the jar and will not move when pressed.
3) If you tap on the center of the top with a metal spoon, you will hear a clear ringing sound rather than a dull thud.

Activity::
Have some sealed and unsealed jars of food. Let audience practice
checking for seals.
Storing canned foods

*Pg.1-26; USDA Complete Guide to Home Canning*
DO NOT TASTE food from a jar with an unsealed lid or when food shows signs of spoilage.

Look for the following signs of spoilage in sealed jars. While holding the jar upright at eye level, rotate the jar and examine its outside surface for streaks of dried food originating at the top of the jar. Look at the contents for rising air bubbles and unnatural color. While opening the jar, check for spurting liquid, smell for unnatural odors and look for cotton-like mold growth (white, blue-black or green) on the top food surface and underside of lid. Carefully discard any jar of spoiled food to prevent possible illness to you, your family, and pets. Before discarding, detoxify any jar of spoiled low-acid food by removing the jar lid, taking care not to spill the contents.

To detoxify, place jar, its contents and the lid in enough hot water to cover the jar. Boil for 30 minutes. Cool and discard all items.
Credits

Adapted from:
- So Easy to Preserve, The University of Georgia Cooperative Extension, 2006.
- University of Georgia, National Center for Home Food Preservation
- Putting Food By, Greene, J., Hertzberg, R., & Vaughan, B. Penguin Group, 2010.

University of Maryland Extension Food Preservation Action Team
Writers: Lynn Little, Rebecca Davis, Dhruvi Patel
Contributors and Reviewers: Lizz Mackey, Terry Serio, Sandy Coridon, Donielle Axline

Graphic Design: Patricia Moore, David Hiner
Questions?
Evaluation and wrap-up.
Welcome participants. Introduce yourself and ask everyone to make a name tent/tag.

This workshop focuses on:
• USDA recommended, science-based canning techniques for low-acid foods;
• how pressure canning works and why it’s necessary;
• types of pressure canners and other essential canning equipment;
• the hands-on component of canning; we will actually can a low-acid food

Introductory Activity:
Ask each participant to introduce themselves and describe their experiences with pressure canning and why they are interested in taking the class. Reassure everyone that this class is appropriate for all levels, regardless of the experience levels of participants.
Acknowledgements

This presentation is adapted from:
- University of Maryland Extension
- University of Missouri Extension
- University of Tennessee Extension
- National Center For Home Food Preservation - University of Georgia Cooperative Extension
- USDA’s Complete Guide to Home Canning

Please give University of Maryland Extension credit for developing these materials.
Review the points on the slide.

Objectives

• Identify low-acid foods
• Learn the science behind pressure canning
• Understand the different types and parts of the pressure canner
• Practice pressure canning
There are two approved methods for canning foods at home. They are not interchangeable methods. High-acid foods are canned in a water bath canner while low-acid foods MUST be canned in a pressure canner. We will learn more about why later.
pH is a measure of acidity.

Don't worry if you find pH values confusing; high-acid foods have low pH values and low acid foods have high pH values. If your canning recipes come from a tested, credible source, the processing methods, times and temperatures have been determined for you.

High-acid foods can be safely processed in a water bath canner; low acid food must be processed in a pressure canner.

There are some foods such as tomatoes and figs, that have pH values that hover around 4.6. They must be acidified to can them in a water bath canner.

*pg. 1-8, 1-9; USDA Complete Guide to Home Canning pg. 9, 46 (reference to Asian Pears acidification)– ; So Easy to Preserve*
pH is a measure of acidity.

You will not need to know the pH value if you are following a tested recipe from a credible source. However, it is important to understand why it is an essential part of the canning equation. The illustration of pH values for different fruits and vegetables makes it easier to understand the variation of pH levels and why some foods must be acidified before canning. We will talk more about acidification later.

pg. 1-8, 1-9 USDA Complete Guide to Home Canning
pg. 9, 46 (reference to Asian Pears acidification)– So Easy to Preserve
Select firm, just ripe (not quite table ready) unblemished produce. Wash well to reduce the microorganisms present on the skin of the produce. Peel the produce when the recipe indicates. Use the appropriate recipe, equipment and processing time for the food that you are canning.
When you find a tested recipe, do not change it. Changing the recipe can make the product unsafe. A tested recipe has been lab-tested for time, temperature and pH.

The best source of instruction for home canning is recently published materials developed by USDA, Cooperative Extension Services at Land Grant universities, and major manufacturers of home canning equipment. Examples of tested recipes can be found in canning cookbooks such as *Ball’s Home Guide to Food Preservation*, *So Easy to Preserve* or recipes contained in pectin or other canning ingredients made by companies such as Mrs. Wages, Ball and Kerr (affiliated companies of Jardin Home brands [www.jardinhomebrands.com](http://www.jardinhomebrands.com)). Some canning cookbooks contain recipes that are not tested. Check the introduction for safety recommendations or check with the publisher.

Avoid using outdated cookbooks (prior to 1997), internet blogs and untrustworthy websites. Cooking internet blogs are not credible sources unless the blog provides the source for the recipe. Untested recipes cannot be trusted as reliable or safe.

*pg. 24; So Easy to Preserve*
Follow Tested Recipes

- Do not alter ingredients
- Changes pH of food
- Do not add extra sugar or fat
- Do not add thickeners
- Do not change the size of food pieces

If you add extra sugar, fat or thickeners like starch, rice or noodles, the tested processing time is no longer accurate and safe.
A pressure canner must be used for low-acid foods because clostridium botulinum spores can only be destroyed at higher temperatures.

Clostridium botulinum is present everywhere in the environment and is harmless except in low-acid, oxygen-free environments. Under these conditions, the bacteria grow and produce toxins dangerous to people and animals.

Low-acid foods such as vegetables are not acidic enough to prevent clostridium botulinum bacteria from growing. Therefore, these foods require processing under pressure, creating a temperature of at least 240º F.

*pg. 6; So Easy to Preserve*

The acid environment created by high-acid foods such as fruits prevents clostridium botulinum spores from germinating, which is why fruit and tomatoes can be canned in a water bath canner.
In other words, you cannot prevent clostridium botulinum spores from growing in a low-acid food such as green beans, by doubling the time and using a water bath canner instead of processing in the pressure canner.

Pressure canning raises temperatures above the boiling point (212°) of water. The high temperature combined with pressure kills harmful bacteria.
A high percentage of water in most fresh foods makes them very perishable. They spoil or lose their quality for several reasons: growth of undesirable microorganisms like bacteria, molds, and yeasts; Activity: of food enzymes; reactions with oxygen; and moisture loss.

Through the process of canning, enzymes that can cause food to spoil are inactivated and oxygen is removed from the jar. Oxygen can cause food to lose quality.

When you process the food, air is driven from the jar. The heating and later cooling forms a vacuum seal which prevents air and the microorganisms it carries from re-entering the jars.

**Note:** The nutritional value of food is degraded by heat. If this is a concern, freezing produce is a better option. Tomatoes canned in a pressure canner are more nutritious than those processed in a water bath canner because of shorter processing times.

• The way to tell if a vacuum seal has formed is to look at the lids after cooling them for 12–24 hours.
• Press the center of the lid with your finger or thumb to see if the lid springs up when you release your finger. If properly sealed, the lid will not move.
• Look at the jar at eye level and see if it looks concave (curved down slightly in the center).
• Tap lid with a spoon and listen for a high-pitched ring.
Altitude matters. This is because water boils at a lower temperature in higher altitudes. Because the lower temperatures are less effective for killing bacteria, the processing time must be increased for water bath canning. For pressure canning, the pressure is increased.

Tested recipes will include information on necessary time adjustments for altitudes above 1,000 feet.

**Note to instructor: Know the altitude at your location.**
Use only mason-type jars made by companies such as Ball, Kerr and Mason.

Half-pint jars are best for small amounts of jams and jellies.

Half-gallon jars are recommended only for high-acid juices because the jars are too large for heat to penetrate dense food products.

With careful handling, jars can be used many times, requiring only new lids. However, you will need to purchase new lids.
Jars, such as the one pictured on the left, with mouths that cannot be sealed with a two-piece canning lid, should not be used. They are for decorative purposes only. There are many old-style canning jars on the market, including some with zinc lids. None should be used for home food preservation.

Mayonnaise or other commercial jars also are not recommended. These jars have a narrower sealing surface and are less tempered than jars made specifically for canning; they will break in a pressure canner.

Activity:
Pass around examples of a commercial glass jar (mayonnaise, peanut butter or spaghetti sauce), a regular canning jar and canning lids. Have participants compare the width of the sealing surfaces with the width of the sealing compound on the lid. Point out that many commercial products are packaged in plastic versus the glass jars previously used.
Previously, it was recommended to sterilize all jars. Now, we know that if you are processing your product for more than 10 minutes, the jars are sterilized in the process. Jars used for jams, jellies, and pickled products that are processed less than 10 minutes must be sterilized. A dishwasher sterilization cycle is acceptable.

Jars will stay warm in an oven heated to 150-200°F. Do not take them out until you are ready to fill them. If the jars are allowed to cool, they may break when you pour hot product into them.
Buy only the lids that you will use in one year. The sealing compound can become dry if stored for long periods. Lids are only intended for one time use.

A nick in the sealing compound may compromise your seal.

Similar to lids, the screw bands should be washed in hot, soapy water but they do not need to be held in simmering water. Metal screw bands can be re-used unless they are dented or rusty.

A sealed lid on your home-preserved food product indicates that a vacuum has formed inside the jar.
Kits are available seasonally at stores and distributors that sell canning equipment (Wal-Mart, Southern States, Target, etc.).

Activity:
Show kit contents; all tools will be used during the hands-on Activity.
Insert spatula between jar and food and move the spatula up and down while turning jar to allow air bubbles to escape.

There is no need to release air bubbles in jams, jellies or other liquid foods such as juices.
Filling Jars

- Wipe rims of jars
- Place lids and rings on jar
- Tighten “fingertip” tight

• Unclean jar rims can interfere with seal.
• “Fingertip” tight means to tighten just until you feel resistance.
• Do not over-tighten as this can cause the seal to fail and your lids to buckle. If rings are too tight, air cannot vent during processing and food will discolor during storage.
• Do not retighten lids after processing jars. This may cause your seal to break.
• Remove the screw bands after your jars have cooled; if left on the jars, they become difficult to remove and may rust.


Activity:
Have several practice jars with lids available for participants to practice “fingertip” tight.
Headspace is the unfilled space between the food and the jar lid.

The space is needed for the expansion of food as the jars are processed and for forming the vacuum as jars cool. Typically, as the processing time increases, so does the amount of headspace. A tested recipe will specify the amount of headspace needed.

Headspace is important. If you have too much headspace, it may take longer for the air to be driven out of the jar. If you have too little headspace, the jar may not seal.
Review the steps of properly filling the jars and the use of the tools.

Activity:
Let the participants identify the steps and describe how the tools are used.
Steps in Pressure Canning

- Put 2 to 3 inches of hot water in canner
- Place filled jars on rack
- Fasten lid securely
- Use high heat setting
- Leave weight off vent port or petcock
- Exhaust steam for 10 minutes

It’s very important to exhaust the steam for 10 minutes to be certain the air is removed from the pressure canner. Be sure steam is flowing freely from the open petcock or vent port.

pg.1-21,22; USDA Complete Guide to Home Canning
After steam has been exhausted (vented) for 10 minutes place the weight on the vent port or close the petcock. The canner will pressurize during the next 3 to 5 minutes.

Once the proper pressure is achieved, begin timing. Regulate heat under the canner to maintain a steady pressure. Fluctuations in pressure can result in liquid loss.

A drop in pressure during processing means the sterilizing value of the process will be decreased. If pressure drops below target during the processing time, bring the canner back up to the proper pressure and start timing the process over from the beginning. This is important for the safety of the food.

Once processed for the specified time, allow the canner to depressurize. A canner is depressurized when the vent lock falls down to its starting position.

DO NOT force cool the canner by turning a fan on it, running it under cold water or trying any other “trick.” The time it takes for the canner to depressurize is important and part of the processing time.

Wait 10 minutes after depressurizing, unfasten the lid and remove it carefully. Lift the lid away from you so that the steam does not burn your face. Remove jars with jar lifter, place them on a towel, leaving at least one-inch of space between all the jars during cooling. Let jars sit undisturbed to cool at room temperature for 12 to 24 hours.

*Steps in Pressure Canning*

- Place weight on vent port or close petcock.
- Process using steady pressure.
- After processing for recommended time, turn off heat.
- Allow canner to depressurize. Do not force-cool.
- Remove pressure regulator from vent port or open petcock.
- Let stand 10 minutes before removing lid and jars.

*pg.1-21,22; USDA Complete Guide to Home Canning.*
Suggested foods to process for this workshop include green beans or carrots in pint jars. Before going to the kitchen read aloud the recipe that you are using in today’s class from beginning to end. Assign each participant a task such as washing, peeling or cutting food. Encourage everyone to pitch in with additional tasks as they complete their first assignment. Each participant should have at least one group task; everyone will fill a jar with product. This is the hands-on portion so it is important for everyone to be encouraged to fully participate.

Note: While jars are being processed, come back together to review equipment and the science behind home food preservation.

Note to instructor: Make sure all of the equipment needed for the canning Activity: is set out prior to the beginning of workshop.
There are two types of pressure canners.

The pressure canner on the left is a dial gauge canner. It is the most commonly used canner and is sold by most distributors. The canner on the right is a weighted gauge canner.

There are two different types of weighted gauge canners. We will discuss the advantages and disadvantages of each in the next slides.
A dial gauge pressure canner must be tested yearly for accuracy. This can be done by some Extension offices or by mailing your gauge to the manufacturer. Presto will check your gauge at no charge except postage. If your gauge is within two PSI of accuracy, you can make adjustments; otherwise you will need to replace the gauge.

Note: *PSI = pounds per square inch of pressure
Review the parts of the pressure canner lid pictured on the slide.

The vent pipe allows excess pressure to be released. The pressure regulator allows pressure to build in the canner but acts as a safety device to prevent pressure in excess of 15 lbs.

Handout: *Parts of a Typical Pressure Canner* by Presto

Note: The *Parts of a Pressure Canner* handout is available by request at 1-800-877-0441.
There are two types of weighted pressure gauges. The weighted gauge on the left consists of 3 rings used to control pressure – 1 ring = 5 lbs. PSI; 2 rings – 10 lbs. PSI; 3 rings = 15 lbs. PSI.

The weighted gauge on the right has 3 fittings, labeled for 5, 10 and 15 lbs. PSI, respectively.

The weighted gauge will make a rocking or jiggling sound, indicating the canner is maintaining the correct pressure.

The only disadvantage of weighted-gauge canners is that they cannot correct precisely for higher altitudes. At altitudes above 1,000 feet, they must be operated at canner pressures of 10 instead of 5, or 15 instead of 10 PSI.

pg. 1-20; USDA Complete Guide to Home Canning
The weighted gauge is a one-piece unit that has a fitting for 5, 10 or 15 PSI, depending upon the food you are canning.
The three-piece weighted gauge has three pieces for 5, 10 or 15 PSI, again depending on the food you are processing.
Review the parts of the pressure canner lid pictured on the slide.
Follow manufacturer’s recommendations for cleaning and maintenance.

If you buy a used pressure canner, make sure you can access the manufacturer’s directions for use. Many pressure canner directions are available on line.
Using Your Pressure Canner the First Time

- Parts are usually pre-lubricated. May need to very lightly coat the exposed gasket and lugs on the canner body with cooking oil.
- Before EACH use: be sure vent pipes are clear and open.
- Become familiar with the process and do a dry run before your first use.

Review the points on the slide.
Pressure cookers/saucepans with smaller volume capacities are not recommended for use in canning because enough heat may not be delivered during processing. Pressure cannot be regulated in small pressure cookers/saucepans.

*pg. 1-17, USDA Complete Guide to Canning*
Review the points on the slide.

Activity:
Set up stations around the room with disassembled pressure canners available for inspection at each station. Divide participants into small groups and hand out a copy of Presto’s Parts of a Pressure Canner handout. Ask the small groups to identify each part on the list. If you have a combination of weighted gauge and dial gauge canners, rotate the groups so that everyone has a chance to inspect both kinds of canners. Provide each participant a pipe cleaner to use for checking vent pipes.

Note: The Parts of a Pressure Canner handout is available by request at 1-800-877-0441.
Review the points on the slide.

**Storing Pressure Canner**

- Thoroughly dry canner, lid and gasket. Do not put lid in water.
  - Older canners: Take off removable petcocks or safety valves. Wash and dry. Reassemble carefully.

- Clean openings by running clean pipe cleaner or thin strip of cloth through them.

- Store canner with crumpled clean paper or paper towels in it; do not fasten the cover.

- Wrap cover in paper and turn upside down on the canner bottom.
Hot Pack

Heat fresh food and liquid to boiling for 2 to 5 minutes before filling jars. This helps:
- remove air
- shrink food
- keep food from floating
- increase vacuum seal
- improve shelf life, color and flavor
- Increase yield per jar

Review the points on the slide.

*pg. 1-12; USDA Complete Guide to Home Canning*
When canning, your recipe may give you the option of hot or raw pack. When you have a choice, hot pack will yield a better product. Generally, raw pack will not be recommended for low-acid foods.

Always use the type of pack that is specified for each food. Many low-acid food recipes only include hot pack directions.

**Raw Pack**

Packing raw, unheated food into jars; cover with boiling liquid.

Raw packed foods should be packed tightly; shrinkage occurs during processing.
Activity:
This slide is animated. Ask participants to guess the type of pack indicated in each picture. Mouse click again and you will be able to see the titles of the picture.

*pg. 1-12; USDA Complete Guide to Home Canning.*
This is a deadly bacteria which grows in low-acid foods. The bacteria form spores that are resistant to high temperatures.

These spores then become vegetative cells that grow in sealed jars and produce a poisonous toxin.

Clostridium botulinum cannot be seen or tasted.
Many of these symptoms could easily be confused with a 24-hour stomach “bug” or a stroke.

This confusion often leads to a delay in treatment. With botulism, a delay in treatment could mean death.
Clostridium Botulinum toxin is a powerful neurotoxin and kills without immediate treatment.

**Activity:**
Read the following true story to participants or break the story into segments and have several individuals take turns reading it aloud.

The following is the edited version to an article written by Elizabeth Andress, Ph.D., National Center for Home Food Preservation, April 2002.

*Botulism: It Only Takes a Taste.*

This is the message behind the story of Loretta Boberg, a 62-year old woman who always tastes food before serving it to company. In this case, the company can be very thankful she did. When Mrs. Boberg opened a jar of home-canned carrots last January, she dipped in a finger to taste the juice. Not liking the taste, she served home-canned beans to her guests instead.

Within two days, Mrs. Boberg became dizzy and had difficulty walking. At first, hospital staff thought she had suffered a stroke because of her slurred speech and muscle weakness. The doctor did ask her if she had eaten any spoiled food lately, however. Too weak to speak, Mrs. Boberg wrote “carrots” on a piece of paper.

If this physician had not suspected botulism, even though he had seen only a few cases, Mrs. Boberg would probably have died. The toxin moved through the respiratory system, paralyzing her muscles. A sample from the jar was fed to a laboratory mouse and it died instantly. A sample of Mrs. Boberg’s blood was given to another mouse and it too died instantly.

The road to recovery for this lady was very slow. Six months later, she remained in the hospital on a respirator, still being fed intravenously. She had stood for only three minutes since the incident, and talked through a tube in her trachea when not out of breath. Muscle movement was returning slowly with the help of physical therapy. Hospital officials estimated that her bill was running about $200,000.
These results are a terrible tragedy, but they could be even worse—botulism is fatal in many cases. Mrs. Boberg used a boiling water canner for the carrots that gave her botulism. Yes, this was the same method she had used—and only by luck had gotten away with—for the past 44 years. This year she was not so lucky.

If, like Mrs. Boberg, you are canning low-acid foods such as vegetables (except tomatoes), red meats, seafood, and poultry in a boiling water canner or by the open kettle method, you may wish to think twice before taking another chance.

Because native spores of Clostridium botulinum, the bacteria that cause the potentially fatal botulism, are extremely difficult to destroy at boiling water temperatures, all low-acid foods should be processed at the much higher temperatures achieved with pressure canners.

Processing times are scientifically determined to ensure destruction of the most heat resistant disease-causing bacteria capable of growing in each type of food packed in a jar of a specific size. Therefore, there are different processing times for different foods.

It takes so many hours at boiling water temperatures to begin to kill Clostridium botulinum spores in low-acid foods that there would be very little, if any, food value or quality remaining at the end of the sterilization process. There is, therefore, no purpose and a lot of risk, to determining canning processes for low-acid foods in a boiling water canner.

The only time a water bath canner can be used is when canning acid foods such as tomatoes, fruits, pickled and fermented products, jams, jellies, marmalades and fruit butters. Once you start to add meat and/or vegetables to soups and tomato sauces, the acidity of that food changes and you must use a pressure canner for most formulations.

What if you don’t own a pressure canner, can’t borrow one or find access to one? Then your only option is to freeze the food. There are no shortcuts to home canning! Home canning takes time, proper processing methods, proper equipment and current, scientifically-based process recommendations. Learn from the tragedy of Mrs. Boberg and don’t take chances with your health or life.

Note to instructor: Breaking the story into paragraphs makes it easier for each participant to take a turn reading.
Pgs. 18-19 So Easy to Preserve
Open kettle canning refers to the practice in which hot food is put into hot jars and lids are attached, assuming that a vacuum is formed with no processing.

Pgs. 286-287; Putting Food By
The inversion method calls for filling a hot jar with hot product and leaving 1/8th inch headspace. The lid is applied and the jar is inverted for five minutes. No processing is done to the jars and it is assumed that a vacuum is formed.

Note: Some very old recipes advocated adding powders or salicylic acid (aspirin) to each canning jar before processing. There is no evidence that doing so will prevent bacteria growth due to improper processing.
When you remove jars from canner, do not retighten lids. It may cause seal failure. Cool jars at room temperature for 12 to 24 hours. Remove screw bands and test seals. You cannot rush this process with ice, fans or cold water.

If the lid fails to seal on a jar, remove the lid and check the jar-sealing surface for tiny nicks. Change jar if necessary, add new lid and re-process within 24 hours, using the same processing time.

_Pgs. -25-26; USDA Complete Guide to Home Canning_
Storing Home Canned Food

- Remove ring from sealed jar
- Clean lid surface
- Label and date jar
- Store jars in a cool, dark, dry place
- Avoid temperature extremes
- Use within one year

Storing canned foods

*pg.1-26; USDA Complete Guide to Home Canning*
DO NOT TASTE food from a jar with an unsealed lid or when food shows signs of spoilage.

Look for the following signs of spoilage in sealed jars:

1. While holding the jar upright at eye level, rotate the jar and examine its outside surface for streaks of dried food originating at the top of the jar.
2. Look at the contents for rising air bubbles and unnatural color.
3. When opening the jar, check for spurting liquid, smell for unnatural odors and look for cotton-like mold growth (white, blue-black or green) on top of the food surface and underside of lid.
4. Carefully discard any jar of spoiled food to prevent possible illness to you, your family, and pets. Before discarding, detoxify any jar of spoiled low-acid food by removing the jar lid, taking care not to spill the contents.

To detoxify, place jar, its contents and the lid in enough hot water to cover the jar. Boil for 30 minutes. Cool and discard all items.
Review the points on the slide.

Principles of Low-acid Canning

- Use a tested recipe
- Use a pressure canner
- Inspect your pressure canner each year before using
- Know your altitude and make necessary adjustments
Credits

Adapted from:
• So Easy to Preserve, The University of Georgia Cooperative Extension, 2006.
• University of Georgia, National Center for Home Food Preservation
• Putting Food By; Greene, J., Hertzberg, R., & Vaughan, B. Penguin Group, 2010.

University of Maryland Extension Food Preservation Action Team
Writers: Lynn Little, Rebecca Davis, Dhruti Patel
Contributors and Reviewers: Liat Mackey, Terry Serio, Sandy Coridon, Donielle Axline

Graphic Design: Patricia Moore, David Hirner
Questions?
Low-acid Canning

Thank you for being here today!

(Grow It Eat It Preserve It!)

Evaluation and wrap-up.
Welcome participants. Introduce yourself and ask everyone to make a name tent/tag.

This session focuses on:
• USDA recommended, science-based canning techniques for tomatoes
• How pressure canning works and why it’s necessary;
• Types of pressure canners and other essential canning equipment; and
• Hands-on component of canning; we will can tomatoes.

Introductory Activity:
Ask each participant to introduce themselves and describe their experiences with canning and why they are interested in taking the class. Reassure participants that this class is appropriate for all levels, regardless of their previous experience.
Please give University of Maryland Extension credit for developing these materials.
Objectives

- Learn the science behind pressure canning
- Understand the different types and parts of the pressure canner
- Practice pressure canning tomatoes

Review the points on the slide.
**pH is a measure of acidity.**

Don’t worry if you find pH values confusing; high-acid foods have low pH values and low acid foods have high pH values. If your canning recipes come from a tested, credible source, the processing methods, times and temperatures have been determined for you.

High-acid foods can be safely processed in a water bath canner; low acid food must be processed in a pressure canner.

There are some foods such as tomatoes and figs, that have pH values that hover around 4.6. They must be acidified to can them in a water bath canner.

*Pg. 1-8, 1-9; USDA Complete Guide to Home Canning*  
*Pg. 9, 50; So Easy to Preserve*

Most tomato recipes can be processed in either pressure or boiling water bath canner. Research shows that for some tomato products, pressure canning is a better method to preserve quality and nutritional value because of shorter processing times. Tomato recipes that specify only pressure canning have so many low-acid ingredients added to them that they are only safe when canned in a pressure canner, at the specified pressure. Regardless of the method, tomatoes must have acid added to them to ensure safety.
There are two approved methods to safely can tomatoes at home. The recipe will dictate which method to use.

Recipes are not interchangeable. If you plan to water bath can your tomatoes, do not use a pressure canning recipe. Increasing the time the tomatoes are processed will not make them safe to eat.
Though we’re not covering this topic today, it’s important to understand when to use a water bath canner.

- Water bath canning
  - used for high-acid foods
  - water reaches $212^\circ$, which kills molds, yeast and some bacteria
A pressure canner must be used for low-acid foods because clostridium botulinum spores can only be destroyed at higher temperatures.

Clostridium botulinum is present everywhere in the environment and is harmless except in low-acid, oxygen-free environments. Under these conditions, the bacteria grow and produce toxins dangerous to people and animals.

Low-acid foods such as vegetables (including tomatoes) are not acidic enough to prevent clostridium botulinum bacteria from growing. Therefore, these foods require processing under pressure, creating a temperature of at least 240°F.

Note: PSI = pounds per square inch of pressure

Pg.6; So Easy to Preserve

The acid environment created by high-acid foods such as fruits prevents clostridium botulinum spores from germinating, which is why fruit and tomatoes can be canned in a water bath canner.
In other words, you cannot prevent clostridium botulinum spores from growing in a low-acid food such as green beans, by doubling the time and using a water bath canner instead of processing in the pressure canner.

Pressure canning raises temperatures above the boiling point (212°F) of water. The high temperature combined with pressure kills harmful bacteria.
A high percentage of water in most fresh foods makes them very perishable. They spoil or lose their quality for several reasons: growth of undesirable microorganisms like bacteria, molds, and yeasts; Activity: of food enzymes; reactions with oxygen; and moisture loss.

Through the process of canning, enzymes that can cause food to spoil are inactivated and oxygen is removed from the jar. Oxygen can cause food to lose quality.

When you process the food, air is driven from the jar. The heating and later cooling forms a vacuum seal which prevents air and the microorganisms it carries from re-entering the jars.

**Note:** The nutritional value of food is degraded by heat. If this is a concern, freezing produce is a better option. Tomatoes canned in a pressure canner are more nutritious than those processed in a water bath canner because of shorter processing times.

- Look at the lids after cooling them for 12-24 hours to tell if a vacuum seal has formed.
- Look at the jar at eye-level and see if it looks concave (curved down slightly in the center).
- Tap lid with a spoon and listen for a high-pitched ring.
Altitude matters. Water boils at a lower temperature in higher altitudes. Because the lower temperatures are less effective for killing bacteria, the processing time must be increased for water bath canning. For pressure canning, the pressure is increased.

Tested recipes will include information on necessary time adjustments for altitudes above 1,000 feet.

Note to instructor: Know the altitude at your location.
Do not change a tested recipe because it can make the product unsafe. A tested recipe has been lab-tested for time, temperature and pH.

The best source of instruction for home canning is recently published materials developed by USDA, Cooperative Extension Services at Land Grant universities, and major manufacturers of home canning equipment. Examples of tested recipes can be found in canning cookbooks such as *Ball’s Home Guide to Food Preservation*, *So Easy to Preserve* or recipes contained in pectin or other canning ingredients made by companies such as Mrs. Wages, Ball and Kerr (affiliated companies of Jardin Home brands [www.jardinhomebrands.com](http://www.jardinhomebrands.com)).

Some canning cookbooks contain recipes that are not tested. Check the introduction for safety recommendations or check with the publisher.

Avoid using outdated cookbooks (prior to 1997), internet blogs and untrustworthy websites. Cooking internet blogs are not credible sources unless the blog provides the source for the recipe. Untested recipes cannot be trusted as reliable or safe.

*Pg. 24; So Easy To Preserve*
Follow Tested Recipes

- Do not alter ingredients
- Changes pH of food
- Do not add extra sugar or fat
- Do not add thickeners
- Do not change the size of food pieces

If you add extra sugar, fat, or thickeners like starch, rice or noodles, the tested processing time is no longer accurate and safe.
Use only mason-type jars made by companies such as Ball, Kerr and Mason.

Half-pint jars are best for small amounts of jams and jellies.

Half-gallon jars are recommended only for high-acid juices because the jars are too large for heat to penetrate dense food products.

With careful handling, jars can be used many times, requiring only new lids. However, you will need to purchase new lids.
Jars, such as the one pictured on the left, with mouths that cannot be sealed with a two-piece canning lid, should not be used. They are for decorative purposes only. There are many old-style canning jars on the market including some with zinc lids. None should be used for home food preservation.

Mayonnaise or other commercial jars also are not recommended. These jars have a narrower sealing surface and are less tempered than jars made specifically for canning; they will break in a pressure canner.

**Activity:**

Pass around examples of a commercial glass jar (mayonnaise, peanut butter or spaghetti sauce), a regular canning jar and canning lids. Ask participants to compare the width of the sealing surfaces with the width of the sealing compound on the lid. Point out that many commercial products are packaged in plastic versus the glass jars previously used.
Preparing Jars for Canning

- Check rim of jar for nicks
- Wash and rinse jars
- Hold in oven or simmering water until ready to fill

Previously, it was recommended to sterilize all jars. Now, we know that if you are processing your product for more than 10 minutes, the jars are sterilized in the process. Jars used for jams, jellies, and pickled products processed for less than 10 minutes must be sterilized. A dishwasher sterilization cycle is acceptable.

Jars will stay warm in an oven heated at 150-200° F. Do not take them out until you are ready to fill them. If the jars are allowed to cool, they may break when you pour hot product into them.
Buy only the lids that you will use in one year. The sealing compound can become dry if stored for long periods. Lids are only intended for one-time use.

A nick in the sealing compound may compromise your seal.

Similar to lids, the screw bands should be washed in hot, soapy water but they do not need to be held in simmering water. Metal screw bands can be re-used unless they are dented or rusty.

A sealed lid on your home-preserved food product indicates that a vacuum has formed inside the jar.
These kits are available seasonally at stores and distributors that sell canning equipment (Wal-Mart, Southern States, Target, etc.).

**Activity:**
Show kit contents and describe how each tool is used. All tools will be used during the hands-on portion of the workshop.
Insert spatula between jar and food and move the spatula up and down while turning jar to allow air bubbles to escape.

There is no need to release air bubbles in jams, jellies or other liquid foods such as juices.
Unclean jar rims can interfere with seal.

“fingertip” tight means to tighten just until you feel resistance.

Do not over-tighten as this can cause the seal to fail and your lids to buckle. If rings are too tight, air cannot vent during processing and food will discolor during storage.

Do not retighten lids after processing jars. This may cause your seal to break.

Remove the screw bands after your jars have cooled; if left on the jars, they become difficult to remove and may rust.

*Pg. 1-16; USDA Complete Guide to Home Canning.*

**Activity:**

Have several practice jars with lids available for participants to practice “fingertip tight.”
Headspace is the unfilled space between the food and the jar lid.

The space is needed for the expansion of food as the jars are processed and for forming the vacuum as jars cool. Typically, as the processing time increases, so does the amount of headspace. A tested recipe will specify the amount of head space needed.

Headspace is important. If you have too much head space, it may take longer for the air to be driven out of the jar. If you have too little headspace, the jar may not seal.
Steps in Pressure Canning

- Put 2 to 3 inches of hot water in canner
- Place filled jars on rack
- Fasten lid securely
- Use high heat setting
- Leave weight off vent port or petcock
- Exhaust steam for **10 minutes**

It’s very important to exhaust the steam for 10 minutes to be certain the air is removed from the pressure canner. Be sure steam is flowing freely from the open petcock or vent port.

*Pg.1-21,22; USDA Complete Guide to Home Canning*
After steam has been exhausted for 10 minutes to be certain the air is removed from the pressure canner, place the weight on the vent port or close the petcock. The canner will pressurize during the next 3 to 5 minutes.

Once the proper pressure is achieved, begin timing. Regulate heat under the canner to maintain a steady pressure. Fluctuations in pressure can result in liquid loss.

Drop in pressure during processing means the sterilizing value of the process will be decreased. If pressure drops below target during the processing time, bring the canner back up to the proper pressure and start timing the process over from the beginning. This is important for the safety of the food.

Once processed for the specified time, allow the canner to depressurize. A canner is depressurized when the vent lock falls down to its starting position.

DO NOT force cool the canner by turning a fan on it, running it under cold water, or trying any other “trick.” The time it takes for the canner to depressurize is important and part of the processing time.

Wait 10 minutes after depressurizing, unfasten the lid and remove it carefully. Lift the lid away from you so that the steam does not burn your face. Remove jars with jar lifter, place them on a towel, leaving at least one-inch of space between all the jars during cooling. Let jars sit undisturbed to cool at room temperature for 12-24 hours.

As mentioned earlier, tomatoes can be canned in a water bath canner or pressure canner; however, research shows that pressure canning tomatoes results in a better quality and more nutritious product. Most recipes will give you the option of canning tomatoes using either method.

Note to instructor: Use this slide to transition to a discussion about choosing and preparing tomatoes for canning. Tell participants that you will come back to a more detailed discussion about the pressure canning process later. Right now, you will be talking about how to choose the best tomatoes for canning, followed by a hands-on pressure canning Activity:

While the tomatoes are processing, you will discuss the process and equipment in more detail.
Tomatoes

- Disease-free, preferably vine-ripened, firm fruit
- Don’t use tomatoes that have been subject to frost
  - Lower in acid (use only for cooking and freezing)

- Select only firm-ripe, unblemished tomatoes; ones that have not quite reached the table-ready stage.
- Discard any with rotten spots or mold.
- Discard any that have open lesions.
- Most types of tomatoes will work but grape and cherry are not recommended, because they have too much skin, seeds and very little pulp.
Review the points on the slide.

*Pgs. 12-13; So Easy To Preserve - Approximate Yields*
You must use commercially bottled lemon juice or vinegar with 5% acidity. This is the acidity level of many commercial products. Read the label to ensure a minimum 5% acidity. Fresh lemons or homemade vinegars may not have accurate acidity levels.

Distilled white vinegar is recommended. You must use twice as much as lemon juice. However, vinegar may cause undesirable flavor change.

You can also use citric acid to acidify tomatoes: ¼ teaspoon citric acid powder = 1 tablespoon of 5% lemon juice/vinegar.

The acid ingredient can be added directly to each jar before adding product.

Note: Salt is optional. If adding salt, use canning salt instead of table salt. Canning salt is pure sodium chloride with nothing added to it. Iodine present in table salt discolors or darkens foods, especially pickled foods.

Pg.50; So Easy To Preserve
Preparing the Tomatoes

• Wash fruit carefully in fresh water
• Cut small X across blossom end
• Dip into boiling water for 30-60 seconds

Review the points on the slide.
Preparing the Tomatoes

- Plunge into ice water to stop cooking
- Slip off skins, ream out the stem end and core, cut off green shoulders, cut out any bruises
- Cut/chop as recipe instructs
- Do not drain or squeeze tomatoes; it results in loss of needed acid
- Measure out needed amount

Review the points on the slide.
Acid in tomatoes reacts with aluminum, copper or iron equipment causing a bitter flavor. Use stainless steel and/or enamel pans and utensils.

Add any flavorings when you open the jars to serve, not when processing.
Before going to the kitchen, read aloud the recipe that you are using in today’s class from beginning to end.

Assign each participant a task such as washing, peeling or cutting food. Encourage everyone to pitch in with additional tasks as they complete their first assignment. Each participant should have at least one group task; everyone will fill a jar with product. This is the hands-on portion so it is important that each person fully participate.

While jars are being processed, discuss the science of home food preservation with the group.

**Note to instructor:** Make sure all of the equipment needed for the canning Activity: is set out prior to the beginning of your workshop.
There are two types of pressure canners.

The pressure canner on the left is a dial gauge canner. It is the most commonly used canner and is sold by most distributors. The canner on the right is a weighted gauge canner.

There are two different types of weighted gauge canners. We will discuss the advantages and disadvantages of each in the next slides.
A dial gauge pressure canner must be tested yearly for accuracy. This can be done by some Extension offices or by mailing your gauge to the manufacturer. Presto will check your gauge at no charge except postage. If your gauge is within two PSI of accuracy, you can make adjustments; otherwise you will need to replace the gauge.

Note: *PSI = pounds per square inch of pressure
Review the parts of the pressure canner lid pictured on the slide.

The vent pipe allows excess pressure to be released. The pressure regulator allows pressure to build in the canner but acts as a safety device to prevent pressure in excess of 15 lbs.

**Handout**: *Parts of a Typical Pressure Canner* by Presto

**Note**: The *Parts of a Pressure Canner* handout is available by request at 1-800-877-0441.
There are two types of weighted pressure gauges. The weighted gauge on the left consists of 3 rings used to control pressure – 1 ring = 5 lbs. PSI; 2 rings = 10 lbs. PSI; 3 rings = 15 lbs. PSI.

The weighted gauge on the right has 3 fittings, labeled for 5, 10 and 15 lbs. PSI, respectively.

The weighted gauge will make a rocking or jiggling sound, indicating the canner is maintaining the correct pressure.

The only disadvantage of weighted-gauge canners is that they cannot correct precisely for higher altitudes. At altitudes above 1,000 feet, they must be operated at canner pressures of 10 instead of 5, or 15 instead of 10 PSI.

Pg. 1-20; *USDA Complete Guide to Home Canning*
The weighted gauge shown here is a one-piece unit that has a fitting for 5, 10 or 15 PSI, depending on the food you are canning.
The three-piece weighted gauge has pieces for 5, 10 or 15 PSI, again depending on the food you are processing.
Review the parts of the canner lid on the slide.
Follow manufacturer’s recommendations for cleaning and maintenance.

If you buy a used pressure canner, make sure you are able to access the manufacturer’s directions for use. Many directions for pressure canners are available online.
Using Your Pressure Canner the First Time

- Parts are usually pre-lubricated. May need to very lightly coat the exposed gasket and lugs on the canner body with cooking oil.

- Before EACH use, be sure vent pipes are clear and open.

- Become familiar with the process and do a dry run before your first use.

Review the points on the slide.
Pressure cookers/saucepans with smaller volume capacities are not recommended for use in canning because enough heat may not be delivered during processing. Pressure cannot be regulated in small pressure cookers/saucepans.

*Pg. 1-17; USDA Complete Guide to Canning*
Activity:
Set up stations around the room with disassembled pressure canners available for inspection at each station. Divide participants into small groups and hand out a copy of *Presto’s Parts of a Pressure Canner*.

Ask the small groups to identify each part on the list. If you have a combination of weighted gauge and dial gauge canners, rotate the groups so that everyone has a chance to inspect both kinds of canners. Provide each participant a pipe cleaner to use for checking vent pipes.

Note: *The Parts of a Pressure Canner* handout is available by request at 1-800-877-0441.
Note to instructor: In the following slides, we are transitioning from talking about equipment to the reasons why you must use the pressure canning method to ensure the safety of low-acid foods, including tomatoes. First, we will discuss methods of packing the jars.
Hot Pack

Heat fresh food and liquid to boiling for 2 to 5 minutes before filling jars.

This helps:
- remove air
- shrink food
- keep food from floating
- increase vacuum seal
- improve shelf life, color and flavor
- Increase yield per jar

Review the points on the slide.

*Pg. 1-12; USDA Complete Guide to Home Canning*
When canning, your recipe may give you the option of hot or raw pack. When you have a choice, hot pack will yield a better product. Generally, raw pack will not be recommended for low-acid foods.

Always use the type of pack that is specified for each food. Many low-acid food recipes only include hot pack directions.
Activity:
This slide is animated. Let participants guess the type of pack indicated by each picture. Mouse click again, and you will be able to see the titles of the picture.
This is a deadly bacteria which grows in low-acid foods. The bacteria form spores that are resistant to high temperatures.

These spores then become vegetative cells that grow in sealed jars and produce a poisonous toxin.

Clostridium botulinum cannot be seen or tasted.
Many of these symptoms could easily be confused with a 24-hour “bug” or a stroke. This confusion often leads to a delay in treatment which could mean death.

**Symptoms of Botulism**

- Dizziness
- Blurred and double vision
- Slurred speech
- Difficulty swallowing
- Nausea, vomiting and diarrhea
- Muscle weakness
Clostridium Botulinum toxin is a powerful neurotoxin and kills without immediate treatment.

**Activity:**

*Read the following true story to participants or break the story into segments and have several individuals take turns reading it aloud.*

The following is the edited version to an article written by Elizabeth Andress, Ph.D., National Center for Home Food Preservation, April 2002.

*Botulism: It Only Takes a Taste.*

This is the message behind the story of Loretta Boberg, a 62-year old woman who always tastes food before serving it to company. In this case, the company can be very thankful she did. When Mrs. Boberg opened a jar of home-canned carrots last January, she dipped in a finger to taste the juice. Not liking the taste, she served home-canned beans to her guests instead.

Within two days, Mrs. Boberg became dizzy and had difficulty walking. At first, hospital staff thought she had suffered a stroke because of her slurred speech and muscle weakness. The doctor did ask her if she had eaten any spoiled food lately, however. Too weak to speak, Mrs. Boberg wrote “carrots” on a piece of paper.

If this physician had not suspected botulism, even though he had seen only a few cases, Mrs. Boberg would probably have died. The toxin moved through the respiratory system, paralyzing her muscles. A sample from the jar was fed to a laboratory mouse and it died instantly. A sample of Mrs. Boberg’s blood was given to another mouse and it too died instantly.

The road to recovery for this lady was very slow. Six months later, she remained in the hospital on a respirator, still being fed intravenously. She had stood for only three minutes since the incident, and talked through a tube in her trachea when not out of breath. Muscle movement was returning slowly with the help of physical therapy. Hospital officials estimated that her bill was running about $200,000.

These results are a terrible tragedy, but they could be even worse—botulism is fatal in many cases. Mrs. Boberg used a boiling water canner for the carrots that gave her botulism. Yes, this was the same method she had used—and only by luck had gotten away with—for the past 44 years. This year she was not so lucky. If, like Mrs. Boberg, you are canning low-acid foods such as vegetables (except tomatoes), red meats, seafood, and poultry in a boiling water canner or by the open kettle method, you may wish to think twice before taking another chance.
Because native spores of Clostridium botulinum, the bacteria that cause the potentially fatal botulism, are extremely difficult to destroy at boiling water temperatures, all low-acid foods should be processed at the much higher temperatures achieved with pressure canners. Processing times are scientifically determined to ensure destruction of the most heat resistant disease-causing bacteria capable of growing in each type of food packed in a jar of a specific size. Therefore, there are different processing times for different foods.

It takes many, many hours at boiling water temperatures to begin to kill Clostridium botulinum spores in low-acid foods that there would be very little, if any, food value or quality remaining at the end of the sterilization process. There is therefore no purpose, and a lot of risk, to determining canning processes for low-acid foods in a boiling water canner. The only time a water bath canner can be used is when canning acid foods such as tomatoes, fruits, pickled and fermented products, jams, jellies, marmalades and fruit butters. Once you start to add meat and/or vegetables to soups and tomato sauces, the acidity of that food changes and you must use a pressure canner for most formulations. What if you don't own a pressure canner, can't borrow one or find access to one? Then your only option is to freeze the food. There are no shortcuts to home canning! Home canning takes time, proper processing methods, proper equipment and current, scientifically-based process recommendations. Learn from the tragedy of Mrs. Boberg and don't take chances with your health or life.

**Note to instructor:** Breaking the story into paragraphs makes it easier for each participant to take a turn reading.
Open kettle canning refers to the practice of putting hot food into hot jars (with attached lids), assuming that a vacuum is formed with no processing.

The inversion method calls for filling a hot jar with hot product and leaving 1/8th inch headspace. The lid is applied and the jar is inverted for five minutes, No processing is done to the jars and it is assumed that a vacuum is formed.

Note: Some very old recipes advocated adding powders or salicylic acid (aspirin) to each canning jar before processing. There is no evidence that doing so will prevent bacteria growth due to improper processing.
Pgs. 32-34; So Easy To Preserve

DO NOT TASTE food from a jar with an unsealed lid or when food shows signs of spoilage.

Look for the following signs of spoilage in sealed jars:

1. While holding the jar upright at eye level, rotate the jar and examine its outside surface for streaks of dried food originating at the top of the jar.
2. Look at the contents for rising air bubbles and unnatural color.
3. When opening the jar, check for spurting liquid, smell for unnatural odors and look for cotton-like mold growth (white, blue-black or green) on top of the food surface and underside of lid.
4. Carefully discard any jar of spoiled food to prevent possible illness to you, your family, and pets. Before discarding, detoxify any jar of spoiled low-acid food by removing the jar lid, taking care not to spill the contents.

To detoxify, place jar, its contents and the lid in enough hot water to cover the jar. Boil for 30 minutes. Cool and discard all items.
More about TOMATOES
Review the points on the slide.

Round tomatoes are suitable for home canning. They are noted for their juicy eating quality and will require longer cooking times to reach a thicker consistency for success, etc.
Choosing Best Tomatoes

- If not using right away, store tomatoes in cool, dry place away from direct sunlight
- Do not refrigerate; refrigeration destroys flavor and stops natural ripening leading to a mealy texture

Review the points on the slide.
Other products made from tomatoes include:

- Relish -- pickled green tomato relish
- Sauces -- tomato paste, ketchup, tomato, spaghetti, puree, juice
- Chutney -- tomato, tomato-apple chutney
- Pickles -- spiced tomatoes, kosher style dill tomatoes, green tomatoes.

Salsas, relish and chutney are all members of the pickled foods family; these are tomato and fruit or vegetable mixtures that rely on the addition of an acid in the form of vinegar or citrus juice to increase acidity of product, allowing it to be processed in a boiling water bath.

_Pgs. 135, 155-166; So Easy To Preserve – recipes for tomato products_

- As a general rule, you are never allowed to substitute one vegetable for another in any recipe because of the danger of changing the pH/acidity level. However, when making tomato salsas, there are some allowable substitutions.
- One type of pepper may be substituted for another; i.e., bell peppers, chilies, jalapenos, etc.
- Do not increase/decrease the total weight of the peppers/chilies (pounds or cups).
- Onions: red, yellow or white may be substituted for each other but do not increase/decrease the weight (pounds or cups).
- **Dried** spices and herbs may be altered or left out.
When you remove jars from canner, do not retighten lids. It may cause seal failure. Cool jars at room temperature for 12 to 24 hours. Remove screw bands and test seals. You cannot rush this process with ice, fans or cold water.

If the lid fails to seal on a jar, remove the lid and check the jar-sealing surface for tiny nicks. Change jar if necessary, add new lid and re-process within 24 hours, using the same processing time.

**Pgs. 1-25-26; USDA Complete Guide to Home Canning**
Storing canned foods

Pg.1-26; USDA Complete Guide to Home Canning
Principles of Low-Acid Canning

- Use a tested recipe
- Use a pressure canner
- Inspect your pressure canner each year before using
- Know your altitude and make necessary adjustments

Review the points from the slide.
Credits

Adapted from:
- So Easy to Preserve, The University of Georgia Cooperative Extension, 2006.
- University of Georgia, National Center for Home Food Preservation
- Putting Food By, Greene, J., Hertzberg, R., & Vaughan, B. Penguin Group, 2010.

University of Maryland Extension Food Preservation Action Team
Writers: Lynn Little, Rebecca Davis, Dhruti Patel
Contributors and Reviewers: Liat Mackey, Terry Serio, Sandy Corridon, Donielle Axlone

Graphic Design: Patricia Moore, David Hiner
Questions?
Evaluation and wrap-up.
Appendix

Appendix 1-2  Food Preservation Resources
Appendix 3  Checklist for Successful Canning
Appendix 4  Equipment and Utensil List
Appendix 5  Altitude Chart
Appendix 6  Sample UME Brochure
Appendix 7-8  Canning Class Inventory for Educators
Appendix 9-15  Activities
  • Botulism: It Only Takes a Taste.
  • Jams and Jellies
  • Sequencing Activity

Appendix 16  Colorado State University Extension- Cost of Preserving and Storing Food
Appendix 17  USDA Basics for Handling Food Safely Survey
Appendix 18  Sample Evaluation
University of Maryland Extension Presents
Grow It Eat It Preserve It Workshops

Grandma didn’t know everything! In fact, some old-fashioned food preservation practices are unsafe. Recipes, processing times and methods, and storage recommendations have all changed. Learn the most up-to-date, evidence-based, nutritious, safe and cost-effective methods for preserving your harvest.

*Grow it Eat It Preserve* It workshops focus on food safety, proper canning equipment, tested recipes and recommended water bath and pressure canning methods.

**For more information on food preservation classes in your county or region contact:**
UME Food Preservation Action Team Chair
Dhruti Patel, Extension Educator, Family & Consumer Sciences
Wicomico County Extension Office
28647, Old Quantico Road,
Salisbury, MD 21801
Email: dhrutip@umd.edu
Phone: 410-749-6141

UME Food Preservation Action Team Members:
Donielle Axline, UME, Frederick County, DInskeep@umd.edu
Cassandra Corridon, UME, 4-H State Office, Corridon@umd.edu
Lynn Little, UME, Washington County, LLittle@umd.edu
UME Grow It Eat it Preserve It

Food Preservation Resources

Literature Resources

- *So Easy to Preserve*, The University of Georgia Cooperative Extension, 2006, University of Georgia, National Center for Home Food Preservation

Online Resources

- The National Center for Home Food Preservation [http://www.uga.edu/nchfp](http://www.uga.edu/nchfp)
The National Center for Home Food Preservation (NCHFP) web site maintained and updated with current research from the University of Georgia. Information for ordering your copy of *So Easy to Preserve* (5th edition) is found on the NCHFP home page. This web site is a great central location for home food preservation information and has an extensive section for educators, including PowerPoint presentations on various aspects of home food preservation.

- [http://foodsafety.psu.edu/default.html](http://foodsafety.psu.edu/default.html)
  This is the home page for a variety of food safety topics from Penn State Extension. The following pages contain more information on home food preservation topics.

- [http://foodsafety.psu.edu/preserve.html](http://foodsafety.psu.edu/preserve.html)
  Home Food Preservation main page, contains several useful links, including a section on critical food safety issues in home food preservation.

- [http://foodsafety.psu.edu/lets_preserve.html](http://foodsafety.psu.edu/lets_preserve.html)
  Home page for the PSU Let’s Preserve Fact Sheets

- [http://foodsafety.psu.edu/supplies.html](http://foodsafety.psu.edu/supplies.html)
  This is a good place to start for manufacturer information when looking for home food preservation supplies.

- [http://www.ag.ndsu.edu/globalfood/fs-spanish.htm](http://www.ag.ndsu.edu/globalfood/fs-spanish.htm)
  UGA, Texas A&M, Wisconsin and some other Extension organizations have created publications in Spanish.

- [http://www.clemson.edu/extension/hgic/food/food_safety/preservation](http://www.clemson.edu/extension/hgic/food/food_safety/preservation)
  Clemson University has an extensive list of publications. Especially useful is Fact Sheet HGIC 3050, *Common Canning Problems*.

- [http://www.extension.umn.edu/distribution/horticulture/DG1424.html](http://www.extension.umn.edu/distribution/horticulture/DG1424.html)
  Useful publication on harvesting and storing home garden vegetables.
• http://www.uaf.edu/ces/pubs/catalog/detail/index.xml?subtopic=Food,%20Nutrition%20and%20Health  Alaska Cooperative Extension publications on home food preservation include some of the more unusual topics such as jerky, and home canning of meat and fish.


• http://umaine.edu/food-health/food-preservation/ University of Maine Extension food preservation.

• http://pubs.ext.vt.edu/category/food-preservation.html University of Virginia Extension food preservation online publications.

• http://food.unl.edu/web/food/preservation University of Nebraska Extension food preservation.

• http://ohioline.osu.edu/lines/food.html Ohio State University Extension online publications includes food safety and food preservation.

• http://www.foodsafety.wisc.edu/preservation.html University of Wisconsin food preservation.

• http://www.foodsafety.gov/experts/askkaren/index.html Type in food safety questions and get immediate responses to frequently asked questions. The ‘virtual food safety expert”. Get UPDATES on RECALLS.

• http://www.fsis.usda.gov/wps/portal/fsis/home Food safety videos, podcasts, info sheets and more. Searchable database for food safety related questions. Link for UPDATES on RECALLS can be found on sidebar on left side of screen.


Canners:


• http://www.allamerican-chefsdesign.com/ All American Canner. Supplies, kits, books, etc. Contact Information: Wisconsin Aluminum Foundry 1-920-686-2701

• http://www.wearever.com/Mirro/Pressure%20Cookers%20and%20Canning%20Accessories/PressureCookersandCanners/Pages/PressureCookersandCanners.aspx WearEver® and Mirro®. Supplies and advice. Contact Information: 1-800-527-7727.
## Checklist for Successful Canning

<table>
<thead>
<tr>
<th>Task</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review recipe and gather ingredients.</td>
<td></td>
</tr>
<tr>
<td>Gather all needed equipment and utensils (refer to the list on the reverse side of this page).</td>
<td></td>
</tr>
</tbody>
</table>
| Fill canner and bring water to simmer                                | • 2-3 inches of water in pressure canner  
• ½ full for water bath canner                                                                 |
| Fill saucepan with water and bring to simmer (use for heating lids)   |                                                                                                       |
| Fill extra pot with water and bring to simmer - use, as needed, to add water to canner, boiling vegetables, etc. |                                                                                                       |
| Wash jars in hot, soapy water and set in simmering water in canner or place in 150°- 200° oven until ready to use. |                                                                                                       |
| Check metal lids and metal ring bands (no rust, no dents), wash and prepare according to manufacturer’s instructions. |                                                                                                       |
| Add clean metal lids to saucepan of simmering water.                 |                                                                                                       |
| Prepare recipe – one batch at a time, do not double recipe.           |                                                                                                       |
| Using funnel, fill hot jars with product, leaving headspace recommended in recipe. |                                                                                                       |
| Use bubble remover/plastic utensil to release any air bubbles present in jars. |                                                                                                       |
| Wipe rims of jars with clean, damp paper towel.                      |                                                                                                       |
| Set metal lids in place using lid wand, add ring bands and tighten “finger tip” tight. |                                                                                                       |
| Set hot jars in canner, being careful not to tilt jars.              |                                                                                                       |
| When canner is full, check water level (according to processing recommendations for water bath and/or pressure canning), adding water if necessary. |                                                                                                       |
| Follow recommended processing procedure and times for your recipe.    |                                                                                                       |
| When processing time is complete:                                    | • For water bath canning: turn off heat, remove lid, and allow canner to stand for 5 minutes.  
• For pressure canning: allow pressure canner to depressurize; remove pressure regulator and let canner cool for 10 minutes before opening. |                                                                                                       |
| Open canner and remove jars (using jar lifter), keeping them upright; cool on towels or other protected surface for 12-24 hours, undisturbed. |                                                                                                       |
| Check lids for proper seal, remove rings, label and store jars. If jars did not seal, freeze or store in refrigerator for use within 2-3 days; or re-process using clean jars and according to recommended procedures. |                                                                                                       |
## Equipment and Utensil List

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Tools</th>
<th>Check/comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 roll</td>
<td>Paper towels</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>Paring knives</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Tongs</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>Slotted spoons</td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td>Stainless steel bowl of different sizes</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Ladles</td>
<td></td>
</tr>
<tr>
<td>Optional</td>
<td>Kitchen shears</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Jar lifter</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Funnel</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Lid wand</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Bubbler remover</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Timer</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Colander</td>
<td></td>
</tr>
<tr>
<td>1 set</td>
<td>Measuring spoons</td>
<td></td>
</tr>
<tr>
<td>1 set</td>
<td>Measuring cups</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>Stock pots</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Saucepans with lids</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Water bath canners/pressure canner</td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td>Dish towels</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>Cutting boards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oven mitts and pot holders</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sharpie <em>(for dating jars)</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canning jars, lids and rings</td>
<td></td>
</tr>
</tbody>
</table>

---

*The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.*
## Altitude Level

<table>
<thead>
<tr>
<th>Maryland Counties</th>
<th>Altitude (Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allegany</td>
<td>420 - 2895</td>
</tr>
<tr>
<td>Anne-Arundel</td>
<td>0 - 300</td>
</tr>
<tr>
<td>Baltimore city</td>
<td>0 - 480</td>
</tr>
<tr>
<td>Baltimore</td>
<td>0 - 966</td>
</tr>
<tr>
<td>Calvert</td>
<td>0 - 168</td>
</tr>
<tr>
<td>Carroll</td>
<td>260 - ≥ 1120</td>
</tr>
<tr>
<td>Caroline</td>
<td>0 - 79</td>
</tr>
<tr>
<td>Cecil</td>
<td>0 - 535</td>
</tr>
<tr>
<td>Charles</td>
<td>0 - 235</td>
</tr>
<tr>
<td>Dorchester</td>
<td>0 - 57</td>
</tr>
<tr>
<td>Frederick</td>
<td>200-1895</td>
</tr>
<tr>
<td>Garrett</td>
<td>960 - 3360</td>
</tr>
<tr>
<td>Harford</td>
<td>0 - 803</td>
</tr>
<tr>
<td>Howard</td>
<td>0 - 873</td>
</tr>
<tr>
<td>Kent</td>
<td>0 - 102</td>
</tr>
<tr>
<td>Montgomery</td>
<td>10 - ≥ 880</td>
</tr>
<tr>
<td>Prince George’s</td>
<td>0 - ≥ 440</td>
</tr>
<tr>
<td>Queen Anne’s</td>
<td>0 - 87</td>
</tr>
<tr>
<td>St. Mary’s</td>
<td>0 - 192</td>
</tr>
</tbody>
</table>

Compiled by the Maryland Geological Survey
(revised Feb 18, 2005)

** Please check the altitude of your location before beginning the food preservation process to ensure the safety of your home canned foods.

### Educator’s name

####, street name, 
City, State—11111 
Phone: 111-111-1111 
Email: abc@umd.edu

“The University of Maryland is an Equal Opportunity Employer an Equal Access Program”
The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.
## Canning Class Inventory for Educators

<table>
<thead>
<tr>
<th>Minimum Requirement</th>
<th>Tools</th>
<th>Check/comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 rolls</td>
<td>Paper towels</td>
<td></td>
</tr>
<tr>
<td>8-12</td>
<td>Paring knives</td>
<td></td>
</tr>
<tr>
<td>4-5</td>
<td>Peelers</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Tongs</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Slotted spoons</td>
<td></td>
</tr>
<tr>
<td>5-6</td>
<td>Stainless steel bowls of various sizes</td>
<td></td>
</tr>
<tr>
<td>8-10</td>
<td>Mixing spoons</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ladles</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Kitchen shears</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Jar lifters</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Funnels</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lid wands</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bubble removers</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Timers</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Colanders</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Measuring spoons</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Measuring cups (for dry and liquid ingredients)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Stock pots</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Saucepans with lid</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Water bath canners</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Steamer/blanching pot</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Pressure canners</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1 dial gauge; 1 weighted gauge)</td>
<td></td>
</tr>
<tr>
<td>8-10</td>
<td>Flexible cutting boards</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dish soap</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Canning jars, rings and lids</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dish towels</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Pipe cleaners</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Oven mitts and pot holders</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Food scale</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Hand soap</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Table cloth</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Plastic washtubs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(if sink is not available)</td>
<td></td>
</tr>
</tbody>
</table>

The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.
The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.

---

**Canning Class Inventory for Educators**

<table>
<thead>
<tr>
<th>Additional Equipment</th>
<th>Check/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablecloth for projector table</td>
<td></td>
</tr>
<tr>
<td>Extension cord</td>
<td></td>
</tr>
<tr>
<td>Projection screen</td>
<td></td>
</tr>
<tr>
<td>Clickers</td>
<td></td>
</tr>
<tr>
<td>Magic markers</td>
<td></td>
</tr>
<tr>
<td>Chart paper and easel</td>
<td></td>
</tr>
<tr>
<td>Participant materials</td>
<td></td>
</tr>
<tr>
<td>Practice jars for lid tightening exercise</td>
<td></td>
</tr>
<tr>
<td>InFocus projector</td>
<td></td>
</tr>
<tr>
<td>Power strip</td>
<td></td>
</tr>
<tr>
<td>Laptop and projection mouse</td>
<td></td>
</tr>
<tr>
<td>Name tents or tags</td>
<td></td>
</tr>
<tr>
<td>Paper lunch bags</td>
<td></td>
</tr>
<tr>
<td>Pens, pencils and sharpies</td>
<td></td>
</tr>
<tr>
<td>Sample jars of home-canned foods</td>
<td></td>
</tr>
</tbody>
</table>

Appendix 8
Activities

**Introduction Activity**

Have each participant introduce themselves and relate their experiences with canning and why they are interested in taking the class. Regardless of experience levels of participants, reassure everyone that this class is appropriate for all levels.

**Jars**

Pass around examples of a commercial glass jar (mayonnaise, peanut butter or spaghetti sauce), a regular canning jar and canning lids. Have participants compare the width of the sealing surfaces with the width of the sealing compound on the lid. Point out that many commercial products previously packaged in glass jars are now plastic.

**Utensil Kit**

Show kit contents; all tools will be used during the hands-on activity.

**Filling Jars**

Have several practice jars with lids available for participants to practice “finger tip tight.”

> Pg 1-16; USDA Complete Guide to Home Canning.

**Raw Pack Hot Pack**

This slide is animated. Let participants guess the type of pack indicated by each picture. Mouse click again, and you will be able to see the titles of the picture.

> Pg 1-12; USDA Complete Guide to Home Canning.

**Let’s Review the Steps**

Let the participants identify the steps and describe how the tools are used.

**Identifying Parts**

Set up stations around the room with disassembled pressure canners available for inspection at each station. Divide participants into small groups and hand out a copy of Presto’s *Parts of a Pressure Canner* handout. Ask the small groups to identify each part on the list. If you have a combination of weighted gauge and dial gauge canners, rotate the groups so that everyone has a chance to inspect both kinds of canners. Provide each participant a pipe cleaner to use for checking vent pipes.

**It Only Takes a Taste**

Read the following true story to participants or break the story into segments and have several individuals take turns reading it aloud.

> The following is the edited version of an article written by Elizabeth Andress, Ph.D., National Center for Home Food Preservation, April 2002.
This is the message behind the story of Loretta Boberg, a 62-year old woman who always tastes food before serving it to company. In this case, the company can be very thankful she did. When Mrs. Boberg opened a jar of home-canned carrots last January, she dipped in a finger to taste the juice. Not liking the taste, she served home-canned beans to her guests instead. Within two days, Mrs. Boberg became dizzy and had difficulty walking. At first, hospital staff thought she had suffered a stroke because of her slurred speech and muscle weakness. The doctor did ask her if she had eaten any spoiled food lately, however. Too weak to speak, Mrs. Boberg wrote “carrots” on a piece of paper. If this physician had not suspected botulism, even though he had seen only a few cases, Mrs. Boberg would probably have died. The toxin moved through the respiratory system, paralyzing her muscles. A sample from the jar was fed to a laboratory mouse and it died instantly. A sample of Mrs. Boberg’s blood was given to another mouse and it too died instantly. The road to recovery for this lady was very slow. Six months later, she remained in the hospital on a respirator, still being fed intravenously. She had stood for only three minutes since the incident, and talked through a tube in her trachea when not out of breath. Muscle movement was returning slowly with the help of physical therapy. Hospital officials estimated that her bill was running about $200,000. These results are a terrible tragedy, but they could be even worse—botulism is fatal in many cases. Mrs. Boberg used a boiling water canner for the carrots that gave her botulism. Yes, this was the same method she had used—and only by luck had gotten away with—for the past 44 years. This year she was not so lucky. If, like Mrs. Boberg, you are canning low-acid foods such as vegetables (except tomatoes), red meats, seafood, and poultry in a boiling water canner or by the open kettle method, you may wish to think twice before taking another chance.

Because native spores of Clostridium botulinum, the bacteria that cause the potentially fatal botulism, are extremely difficult to destroy at boiling water temperatures, all low-acid foods should be processed at the much higher temperatures achieved with pressure canners. Processing times are scientifically determined to ensure destruction of the most heat resistant disease-causing bacteria capable of growing in each type of food packed in a jar of a specific size. Therefore, there are different processing times for different foods.

It takes many, many hours at boiling water temperatures to begin to kill Clostridium botulinum spores in low-acid foods that there would be very little, if any, food value or quality remaining at the end of the sterilization process. There is therefore no purpose, and a lot of risk, to determining canning processes for low-acid foods in a boiling water canner. The only time a water bath canner can be used is when canning acid foods such as tomatoes, fruits, pickled and fermented products, jams, jellies, marmalades and fruit butters. Once you start to add meat and/or vegetables to soups and tomato sauces, the acidity of that food changes and you must use a pressure canner for most formulations. What if you don’t own a pressure canner, can’t borrow one or find access to one? Then your only option is to freeze the food. There are no shortcuts to home canning! Home canning takes time, proper processing methods, proper equipment and current, scientifically-based process recommendations. Learn from the tragedy of Mrs. Boberg and don’t take chances with your health or life.
Jams and Jellies

Write the following questions on a flip chart. What’s your favorite jam, jelly, etc.?
What questions do you have about making jams and jellies?
When making jams and jellies what problems have you experienced?
What do you hope to learn today?
Take a few minutes to discuss participants’ responses.

Jellied Products

Provide six samples of jellied products such as jelly, jam, marmalade, fruit butter, and preserves to taste and identify. You may want to include one sugar-free product for comparison. Have participants do a blind taste test. List all the sample products on a flip chart and have participants identify each.

Testing for Seals

Have some sealed and unsealed jars of food. Let participants practice checking for seals.

What to Do…?

(Refer participants to pages 232-237 of So Easy to Preserve for solutions to many of the common problems some of which are listed on the slide.)

Using the chart on pages 234-237 of So Easy to Preserve as reference, list a variety of problems encountered when making jellied products on index cards. Hand out one card to each person and ask them to research the problem, the causes and the remedies. This can be done individually and/or in small groups. Have everyone report their findings to the entire group. This exercise can help participants become more familiar with the contents of their resource book So Easy to Preserve.

Scenarios

Write the following scenarios on index cards and ask for volunteers to read each one. After reading aloud, ask participants to spend about 3-5 minutes discussing with the person next to them what was done correctly/incorrectly and how the problem can be remedied, if necessary. Share responses.

1. Auntie Mamie is preparing her famous apple jelly recipe from So Easy to Preserve. She pours the jelly into 6 sterilized jars, using all recommended canning procedures. She has enough left over for an additional jar. She washes a new jar in hot soapy water and pours the rest of the jelly into the jar. She has just enough jelly for the additional jar, leaving ¼ inch headspace. The processing time for this recipe is 12 minutes. Is Auntie Mamie’s last jar of jelly safe to eat? Why or why not? (Answer: Yes, it is safe to eat. The jar was washed according to recommendations and the processing time is greater than 10 minutes so the jar will be sterilized during the canning process.)
2. Mr. Andrews has a large garden. This year, he has a bumper crop of green beans and today he has decided to can a dozen pint jars of beans. He blanches his beans and pours them into 7 pint jars in his water-bath canner. He sets the timer for 40 minutes. Is he following the correct procedure? Why or why not? (Answer: No, he is not following the correct procedure and his beans will not be safe to eat. Beans are a low-acid food and MUST be canned in the pressure canner. If he followed a tested recipe, it would specify that green beans must be pressure canned.)

3. Sally is diabetic. She has decided to make strawberry jam using her own recipe that requires half of the sugar of the recipe from So Easy to Preserve, which calls for only sugar and strawberries. She is freezing her jam. Will the product be safe? What might you recommend as an alternative to Sally’s method? (Answer: As long as Sally freezes her jam, it will be safe to eat; however, the jam will most likely be very runny because sugar is a necessary part of the gelling process. If Sally wants to reduce the sugar in her jam, she could use a recipe for strawberry jam with pectin and artificial sweetener.)
### Sequencing Activity

Avery Labels – 5163

Cut and paste labels on 3" x 5" index cards and laminate for multiple uses.

Have participants work in small groups or individually to put the items in order of sequence for completing the canning process.

Checklist for successful canning can be used for checking for correct order after activity is complete.

<table>
<thead>
<tr>
<th>Review recipe and gather ingredients</th>
<th>Gather all needed equipment and utensils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill canner and bring water to simmer</td>
<td>Fill saucepan with water and heat to simmering; add clean metal jar lids</td>
</tr>
<tr>
<td>(Pressure canner – 2-3 inches in bottom of canner) (Water bath – canner ½ full)</td>
<td></td>
</tr>
<tr>
<td>Fill saucepan/stockpot with water and bring to boil (use for adding water to canner and/or heating vegetables as needed)</td>
<td>Inspect jars, metal lids and metal screwbands. Wash in hot, soapy water and rinse in hot water</td>
</tr>
<tr>
<td>Step</td>
<td>Instructions</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
</tr>
<tr>
<td>1</td>
<td>Put hot, clean jars in warm oven to keep hot until ready for use.</td>
</tr>
<tr>
<td>2</td>
<td>Add clean metal lids to saucepan of simmering water</td>
</tr>
<tr>
<td>3</td>
<td>Prepare recipe, one batch at a time.</td>
</tr>
<tr>
<td>4</td>
<td>Fill hot jars with product, leaving recommended headspace.</td>
</tr>
<tr>
<td>5</td>
<td>Remove air bubbles with bubbler (or plastic utensil).</td>
</tr>
<tr>
<td>6</td>
<td>Wipe rim of jar with damp, clean paper towel.</td>
</tr>
<tr>
<td>7</td>
<td>Place pre-heated metal lid on clean jar rim, add ring band and tighten fingertip tight.</td>
</tr>
<tr>
<td>8</td>
<td>Using jar lifter, place jar in canner, on a rack, being careful not to tilt jar.</td>
</tr>
</tbody>
</table>

The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.
<table>
<thead>
<tr>
<th>When canner is full, check water level, adding water if necessary.</th>
<th>Process according to recipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>When processing time is complete, turn off the heat and allow water bath canner to stand for 5-10 minutes.</td>
<td>When processing time is complete, turn off heat and allow canner to cool completely and de-pressurize.</td>
</tr>
<tr>
<td>Remove jars from canner, placing them on a towel or protected surface and allow to cool undisturbed for 12-24 hours.</td>
<td>Check lids for proper seal, remove rings, wipe off exterior of jars, label and store.</td>
</tr>
</tbody>
</table>

If jars did not seal, store in refrigerator for use within 2-3 days; reprocess according to recommended procedures or adjust headspace to 1 ½ inches and freeze for use within 6-9 months.
Colorado State University

Cost of Preserving and Storing Food

Fact Sheet No. 8.704 Food and Nutrition Series | Preparation

by P. Kendall and L. Payton

One way to help manage rising food costs is with a garden hoe and canning jars. Home food preservation does save money for some people. For others, it may not. Costs to consider include produce and added ingredients, equipment and supplies, fuel consumption to preserve and store the foods, lost interest on large capital outlays such as a freezer, personal time and energy, and the cost of similar food preserved commercially.

Produce Costs

Produce used in home food preservation may come from several sources: home gardens, roadside markets, pick-your-own fields, or gifts from "green-thumb" family or friends.

If you purchase the produce, the cost is evident. If you have a garden, some costs to consider include the cost of the land, special costs to till the soil, the cost of such reusable equipment as garden tools; the cost of non-reusable items such as seeds, fertilizer, pesticides and water; and your time and energy.

The harvest value of your gardening efforts will depend on the market value of the food produced minus any costs incurred. If you produce a bumper crop, the savings may be great. However, if you're plagued with crop failures, the savings may be small.

Although gardening may not be exceptionally profitable when you consider your time, it does offer many side benefits. In addition to the cash you don't spend at the supermarket, you gain through healthy outdoor exercise, opportunities for family activities, across-the-fence neighborhood and the pleasure of sharing extra produce with neighbors and friends. Other benefits include the ready availability of fresh garden produce without making a trip to the supermarket, that fresh-from-the-garden good taste, and the challenge and ecological satisfaction of growing some of your own food. (See Table 6 for a worksheet on estimating produce costs.)

Freezing Costs

Freezing has advantages and disadvantages for food preservation. The two main advantages are that the procedure is simple and that it keeps food more like fresh produce than any other method of long-term preservation.

A disadvantage is the cost to buy and operate a freezer. If you already have one for convenience, freezing inexpensive sources of produce can be an economical way to provide a variety of high quality fruits and vegetables during out-of-season months. Also, home frozen foods can be preserved to your own taste or special diet needs.

Some costs associated with freezing food include:
- Initial cost of freezer, divided over 20 years if new, nine years if used;
- Lost interest on cash outlay for freezer;
- Maintenance and repair;
- Electricity needed to reach and maintain 0 degrees F;
- Packaging materials;
- Water and fuel to prepare food for freezing; and
- Added ingredients, such as sugar or anti-darkening agents.

The initial cost of a freezer varies with size, type, special features and age. New freezers should require little repair the first year or so. However, in the long run the U.S. Department of Agriculture (USDA) recommends an expected repair cost on new freezers of 2 percent of the purchase price per year. For used freezers, this rate may be higher.

The money put into a freezer may or may not have been invested to bring cash income or to pay debts. If the interest from an alternative investment is considered in the cost of owning a freezer, base the rate on the

Quick Facts

- Home food preservation saves money for some people. For others it may not save anything.
- Costs to consider when figuring the economics of food preservation include: produce and ingredients, equipment and supplies, fuel consumption, capital outlays, time and energy, and the cost of similar food preserved commercially.
- Freezing is simple and keeps food more like fresh produce than other preservation methods. However, a freezer is costly to purchase and operate.

© Colorado State University Extension. 9/98. Revised 9/08.
www.ext.colostate.edu

Appendix 16
Basics for Handling Food Safely

Food Safety Information

For a copy of the complete publication shown below, please visit,

Safe steps in food handling, cooking, and storage are essential to prevent foodborne illness. You can’t see, smell, or taste harmful bacteria that may cause illness. In every step of food preparation, follow the four steps of the Food Safe Families campaign to keep food safe:

**Preparation**
- Always wash hands before and after handling food.
- Don’t cross-contaminate. Keep raw meat, poultry, fish, and their juices away from other food.
- After cutting raw meat, wash hands, cutting board, knife, and counter tops with hot, soapy water.
- Marinate meat and poultry in a covered dish in the refrigerator.
- Sanitize cutting boards by using a solution of 1 teaspoon chlorine bleach in 1 quart of water.

**Storage**
- Always refrigerate perishable food within 2 hours—1 hour when the temperature is above 90°F (32.2°C).
- Check the temperature of your refrigerator and freezer with an appliance thermometer. The refrigerator should be at 40°F (4.4°C) or below and the freezer at 0°F (-17.7°C) or below.
- Cook or freeze fresh poultry, fish, ground meats, and variety meats within 2 days; other beef, veal, lamb, or pork, within 3 to 5 days.
- Perishable food such as meat and poultry should be wrapped securely to maintain quality and to prevent meat juices from getting onto other food.
- To maintain quality when freezing meat and poultry in its original package, wrap the package again with foil or plastic wrap that is recommended for the freezer.
- Canned foods are safe indefinitely as long as they are not exposed to freezing temperatures, or temperatures above 90°F (32.2°C). If the cans look ok, they are safe to use. Discard cans that are dented, rusted, or swollen. High-acid canned food (tomatoes, fruits) will keep their best quality for 12 to 18 months; low-acid canned food (meats, vegetables) for 2 to 5 years.

**Thawing**
- Refrigerator: The refrigerator allows slow, safe thawing. Make sure thawing meat and poultry juices do not drip onto other food.
- Cold Water: For faster thawing, place food in a leak-proof plastic bag. Submerge in cold tap water. Change the water every 30 minutes. Cook immediately after thawing.
- Microwave: Cook meat and poultry immediately after microwave thawing.

**Cooking**
- Cook all raw beef, pork, lamb and veal steaks, chops, and roasts to a minimum internal temperature of 145°F (62.8°C) as measured with a food thermometer before removing meat from the heat source. For safety and quality, allow meat to rest for at least three minutes before carving or consuming. For reasons of personal preference, consumers may choose to cook meat to higher temperatures.
- Ground meat: Cook all raw ground beef, pork, lamb, and veal to an internal temperature of 160°F (71.1°C) as measured with a food thermometer.
- Poultry: Cook all poultry to an internal temperature of 165°F (73.9°C) as measured with a food thermometer.

The Food Safety and Inspection Service (FSIS) is the public health agency in the U.S. Department of Agriculture responsible for ensuring that the nation’s commercial supply of meat, poultry, and egg products is safe, wholesome, and correctly labeled and packaged.

USDA Meat & Poultry Hotline
1-888-MPHotline
(1-888-674-6854)

The University of Maryland Extension programs are open to any person and will not discriminate against anyone because of race, age, sex, color, sexual orientation, physical or mental disability, religion, ancestry, national origin, marital status, genetic information, political affiliation, and gender identity or expression.
### Sample Evaluation:

<table>
<thead>
<tr>
<th>Date:</th>
<th>Male / Female (circle one)</th>
<th>never rarely sometimes often always</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>After today, will you feel confident in your ability to safely operate a pressure canner?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Before today, did you feel confident in your ability to safely operate a pressure canner?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After today, will you feel confident in your ability to safely operate a water bath canner?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Before today, did you feel confident in your ability to safely operate a water bath canner?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After today, will you understand food safety concerns for preserving foods at home?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Before today, did you understand food safety concerns for preserving foods at home?</td>
</tr>
</tbody>
</table>

---

For Official Use Only  Do Not Write in this Space

<table>
<thead>
<tr>
<th>County:</th>
<th>Audience: Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor:</td>
<td></td>
</tr>
<tr>
<td>Project Title: Grow It Eat It Preserve It</td>
<td>Code Number:</td>
</tr>
</tbody>
</table>