Lesson 8—Miscellaneous Food Safety, Preservation, and Storage Information

Objectives
This lesson provides students with resources and information on a variety of topics.

In this Lesson
• Food Safety
  • Guidelines for using manure on vegetable gardens
  • Preparation of cider for home use

• Food Preservation and Storage
  • Food preservation on the web
  • Major canning errors
  • Recommended varieties of produce for canning and freezing
  • Preserving foods for special diets (low-sugar or low-salt)
  • Substitution of other sweeteners for sugar
  • Canned fruit pie fillings
  • Vegetables in oil
  • Vegetables canned in a vinegar oil mixture
  • Storing garlic

• Some common questions

Web sites
• University of Georgia Extension
  http://www.fcs.uga.edu/college/search.html

• Pennsylvania State University Extension
  http://foodsafety.cas.psu.edu/preserve.html

• Utah State University Extension
  http://extension.usu.edu/htm/publications
Food Safety

Pathogens (microorganisms which cause disease) can be transferred from animal manure to humans. Pathogens that have been linked to manure applications include bacteria such as *Listeria*, *Salmonella*, and *E. coli* O157:H7, as well as parasites such as roundworms and tapeworms.

Publicity about illnesses due to *E. coli* has made people much more aware of the potential risk of foodborne illness from manure contamination of food. Due to this increased awareness many people are now asking about the safety of using manure on garden soil.

When fresh manure is used in a vegetable garden, there is a risk that pathogens that cause disease may contaminate garden vegetables. The risk of manure application is greatest for root crops like radishes and carrots, vine crops such as pumpkin and squash and for leafy vegetables such as lettuce where the edible part touches the soil. Careful washing and/or peeling will remove most of the pathogens responsible for disease. Thorough cooking is even more effective at killing pathogens on garden crops.

To reduce the risk of disease, we suggest these precautions:

1. **Composted manure is safest to use for gardens.** The American Organic Standards for compost production to kill human pathogens state that the compost must reach a temperature of at least 130°F for a period of several days, be thoroughly mixed, and achieve that temperature again before finishing for a period of approximately six weeks.

2. **If fresh (uncomposted) manure is to be used it should be applied before planting and roto-tilled or disked into the soil.** The American Organic Standards state that unless manure is composted, it must be applied at least 120 days prior to harvest of products likely to be eaten raw or 90 days prior to harvest of products protected by a husk, pod or shell.

Any manure applied after planting should be composted manure.

1. No animal manure or manure-containing product of any kind should be applied within 30 days of harvest unless commercially processed and guaranteed pathogen free.

2. **For added safety, use potable water or canal water known to meet the bacteriological standards of potable water for irrigating vegetables that are to be eaten raw.** This is particularly important within one month of harvest.
3. Thoroughly wash raw vegetables before eating.

4. Do not use cat, dog, or pig manure in gardens or compost piles because parasites that can be in these manures may survive and remain infectious for people.

5. People who are especially susceptible to foodborne illnesses should avoid eating uncooked vegetables from manure gardens. Those who face special risks from foodborne illness include pregnant women, very young children, and those with chronic diseases such as cancer, kidney failure, chronic liver disease, diabetes, or AIDS.

Guidelines for Using Manure on Vegetable Gardens Continued

Preparation of Cider for Home Use

Drinking apple cider that was not pasteurized has caused several outbreaks of illness from E. coli O157:H7. The most likely way that apples get contaminated with E. coli O157:H7 is from cow, sheep or deer manure when they fall onto the ground in the orchard. However, other means of contaminating the fruit include dust, humans and irrigation water.

Anytime cider is made from fresh apples, there is a risk that E. coli or other bacteria will be in the finished product. The only way to assure that the bacteria are killed is to pasteurize the cider or juice by heating it. Pasteurization is particularly important when using apples that have dropped from the trees.

Use the following procedures to make pasteurized apple cider:

1. Wash the apples thoroughly with water.

2. Press the apples to make cider.

3. Pasteurize the apple juice by heating to at least 160°F to kill any harmful bacteria (such as E. coli O157:H7) that may have been on the apples.

4. Keep the cider refrigerated.

Caution: Young children, elderly and immune-compromised should not drink fresh apple cider unless it has been heated to at least 160°F.
The World Wide Web is a powerful search tool for information about food preservation. However, caution is advised because there’s also lots of misinformation on the web as well as untested and potentially unsafe recipes.

Screening Websites for Information—The end of the website identifies the type of organization that hosts the site.

- Government: .gov or .us
- Education: .edu
- Commercial: .com
- Non-profit organizations: .org

University websites are an excellent source of food preservation information. Personal websites, recipe and cooking websites may contain very unsafe recipes. Do not use these types of websites as sources of recipes for food preservation. For more information about food preservation on the web, check out the fact sheet “Food Preservation on the Web” at http://foodsafety.wsu.edu/consumers/factsheet22.htm

Notes:
## Potentially Deadly Errors

<table>
<thead>
<tr>
<th>What</th>
<th>Why it is unsafe</th>
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</thead>
<tbody>
<tr>
<td>Making up own canning recipe.</td>
<td>Without scientific testing, you will not know how long the product needs to be processed to be safe.</td>
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<tr>
<td>Adding extra starch, flour or other thickener to recipe.</td>
<td>This will change the rate of heat penetration into the product and can result in undercooking.</td>
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<tr>
<td>Adding extra onions, chili, bell peppers, or other vegetables to salsas.</td>
<td>The extra vegetables dilute the acidity and can result in botulism poisoning.</td>
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<tr>
<td>Using oven instead of water bath for processing.</td>
<td>The product will be under processed since air is not as good a conductor of heat as water or steam. The jars also may blow up.</td>
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<tr>
<td>Not making altitude adjustments.</td>
<td>Since boiling temperatures are lower at higher altitudes, the products will be under-processed.</td>
</tr>
<tr>
<td>Not venting pressure canner first.</td>
<td>Lack of venting can result in air pockets that will not reach as high a temperature.</td>
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<tr>
<td>Not having gauge pressure canners tested annually.</td>
<td>If the gauges are inaccurate, the food may be under processed.</td>
</tr>
<tr>
<td>Failure to acidify canned tomatoes.</td>
<td>Not all tomatoes have an adequate acid level, especially if the vine is dead. This can result in botulism poisoning.</td>
</tr>
<tr>
<td>Cooling pressure canner under running water.</td>
<td>Calculations as to processing time include the residual heat during the normal cool-down period as part of the heat process. Hurrying this process will result in under processed food.</td>
</tr>
<tr>
<td>Letting food cool before processing in the recipes that call for “hot pack.”</td>
<td>The heat curves are based on the food being hot at the beginning of the processing. Product could be under processed.</td>
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Major Canning Errors continued

Economic Loss, but Error not Deadly

<table>
<thead>
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<tbody>
<tr>
<td>Use of mayonnaise jars.</td>
<td>The jar may blow up, especially if used in a pressure canner, and it may be more difficult to obtain a good seal. However, if it seals, it is safe to eat.</td>
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<tr>
<td>Use of paraffin on jams and preserves.</td>
<td>Small air holes in the paraffin may allow mold to grow. Also paraffin can catch on fire if overheated. If there is mold growth, throw out the product.</td>
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<tr>
<td>Cooling too slowly after removing from canner. (Example: jars stacked close together)</td>
<td>There is a group of harmless organisms called thermophiles, which can survive canning. If bottles are held hot for long periods, these bacteria can produce acid. This results in the defect known as “flat-sour.” Harmless, but very undesirable flavor.</td>
</tr>
<tr>
<td>Storing food longer than recommended.</td>
<td>Lengthy or overly hot storage will decrease quality and some nutrients, but the product will still be safe to eat.</td>
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General rules to always follow:

1. Always follow exactly a scientifically tested recipe. (Exceptions listed below.)
2. Make altitude adjustments by adding more time to water bath canning or increasing pressure for pressure-canned products.
3. Unless you are sure that everything was perfect in the processing of low-acid foods, boil the product for 10 minutes before eating it.

The exceptions to the rule of never changing anything in a canning recipe:

Feel free to:

1. Change salt level in anything except pickles.
2. Change sugar level in syrup used for canned fruit.
3. Add extra vinegar or lemon juice.
4. Decrease any vegetable except tomatoes in salsas.
5. Substitute bell peppers, long green peppers or jalapeño peppers for each other in salsa recipes as long as you do not increase the total amount.

Adapted from Major Canning Sins, FN-250.7, by Charlotte P. Brennand, PhD, Extension Food Safety Specialist, Utah State University, Logan, UT.
### Recommended Fruit Varieties for Preservation

(Does not include all varieties—Revised 2003)

#### Cherries
- **Bings** sweet, dark cherry (June/July) excellent for canning
- **Lamberts** slightly larger but softer (July) excellent for canning
- **Van** similar to Bings, more pointed in shape, excellent for canning
- **Chinook** sweet juice, softer, harder to handle
- **Royal Ann** light yellow with red blush, good flavor, maraschino cherries and canning
- **Rainier** white with a red blush, higher quality than Royal Ann, maraschino cherries and canning

#### Pie Cherries
- **Montmorency** most common, meaty, bright red

#### Pears
- **Bartlett** ideal for canning and drying
- **Red Bartlett** has a red blush but very similar to the Bartlett
- **D’Anjou** winter pear
- **Bosc** winter pear

#### Peaches
- **Early Elberta, Elberta, Improved Elberta, and O’Henry** excellent for canning, drying, freezing
- **Hale** good flavor and aroma, darker juice, not stringy
- **Red Haven** can act like a cling peach if not fully ripened, very good canned
- **Red Globe** red blush (cross between Red Haven and Improved Elberta) very good canned

#### Apricots
- **Tilton** canning variety, but can be bland, poor when dried
- **Moorpark** if fully ripened good for drying, but can fall apart in canning (this type tends to ripen from the blossom to the stem and never quite equal)
- **Royal** and **Royal types** (including Blenhein) can have a red blush, good flesh, excellent for all uses, fresh or canned or dried
- **Perfection** large fruit, canning variety
- **Rival** canning variety, good flavor
- **Riland** similar to Rival, canning variety, smaller
Recommended Varieties for Preservation continued

Pickles and Sauerkraut

**Pickles**—Use cucumbers that are pickling cucumbers. (Slicing cucumbers do not make high-quality pickles.)

**Sauerkraut**—Use fall maturing varieties. Early varieties are lower in sugar and less desirable for making kraut.

Vegetables

**Tomatoes**—Italian and pear-type varieties are good for making sauce, salsa, ketchup, and purees.

**Sweet Corn**—Choose varieties that are not super sweet for canning. Sometimes super sweet corn turns brown when canned.

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**Preserving Foods for Special Diets**

*(low-sugar or low-salt)*

People who are reducing their sugar or salt intake can preserve foods at home to meet their special needs by using food preservation methods such as freezing, canning, or drying because these methods don't require sugar or salt for their preservation effects.

**Canned or Frozen Fruits**—The sugar specified in canning and freezing is only needed for its effect on flavor and texture.

Water or natural fruit juices, such as apple juice, can be used in place of sugar syrups for canning and freezing fruits. Try a variety and see what you like. Good combinations are peaches canned or frozen in orange juice, pears or apples canned in apple juice or pineapple juice, and berries frozen in cranberry juice. The texture of low-sugar canned or frozen fruits may be somewhat mushy because sugar aids in holding the shape of the fruit.

**Jams and Jellies**—Sugar in jams and jellies promotes gel formation and serves as a preservative. The keeping quality is changed when sugar is decreased in jams and jellies. Follow storage directions carefully for reduced-sugar spreads.

Regular pectin requires sugar for jelling. If sugar is reduced in most recipes using regular pectin, the jelly will have syrup consistency, since the correct proportions of fruit, pectin, and sugar are essential for jelling.

Pectins that require less sugar or no sugar for jelling are available. These modified pectins can be used to make jams and jellies with reduced or no added sugar.

**Pickles**—Fermented pickles and sauerkraut require salt for preservation. Some fresh-pack pickles and relishes require a salt soak to produce the desired texture. However, there are many fresh-pack pickles that can be made safely without salt.
There are many pickle recipes that call for little or no sugar and may be used without modification in a low-sugar diet. Sugar in pickles is used to add flavor and to balance the tartness of the vinegar. If sugar is eliminated from pickle recipes, the pickles or relish may taste quite tart.

Canned Vegetables and Meats

- Salt is used only for flavoring these foods and may be removed safely.

Substitution of Other Sweeteners for Sugar

**Honey**

- Honey can replace some of the sugar in preserved foods. Substituting honey for sugar does not reduce the sugar content of preserved foods. Be sure to use light, mild-flavored honey if you don't want noticeable flavor changes in your preserved product.

- The flavor of honey is sweeter than that of granulated sugar so it is advisable to use less honey than the amount of sugar specified in recipes for canned or frozen foods.

- In jelly recipes without added pectin, honey can replace up to one-half of the granulated sugar. With added pectin, honey can replace up to one-fourth of the sugar.

**Corn Syrup**

- Corn syrup can replace up to half the amount of sugar in making syrups for canned fruits. Be sure to use light corn syrup. Dark corn syrup, sorghum, and molasses should not be used because their flavor overpowers the fruit flavor and may darken the fruit.

**Non-calorie and Low-calorie Sweeteners**

- Non-calorie and Low-calorie Sweeteners—Some of the low-calorie sweeteners are not stable to heat and freeze, so the best quality product is usually obtained by canning or freezing the food without any added sweeteners. Add the low-calorie sweetener just before serving.

- Some newer low-calorie sweeteners (sucralose) do retain sweetness during cooking and baking and are reported to be satisfactory for canning.

- If you do add artificial sweeteners, it is better to *under* sweeten the fruit than to *over* sweeten. You can always add more sweeteners later. The fruit's tartness will help determine the amount of artificial sweetener to add.

Revised 2003

**Notes:**
Canned Fruit Pie Fillings

The USDA Complete Guide to Home Canning contains fruit pie fillings (page 2-17 through 2-23) that are excellent, safe products when processed according to the directions in each recipe. Each canned quart makes one 8 to 9-inch pie.

Because the variety of fruit may alter the flavor of the fruit pie, can a trial quart and make a pie with it. Then adjust the sugar and spices in the recipe to suit your personal preferences. The amount of lemon juice should not be altered, because it helps with the safety and storage stability of the fillings. These fruit pie fillings are best if used within one-year and safe as long as lids remain vacuum-sealed.

These recipes use a modified food starch called Clear Jel®. This starch produces the correct thickening, even after the fillings are canned and baked. Other starches, such as cornstarch, break down and result in a runny filling. Clear Jel® must be used as the thickener in these recipes; there is no substitute. Also, do not use any other form of Clear Jel® such as Instant Clear Jel®.

There are about 3 cups in each pound of Clear Jel®. The fruit pie filling recipes use 1 1/2 to 2 1/4 cups per 6-7 quarts of pie filling.

Clear Jel® is not available in most grocery stores. Use an Internet search engine to find sources available to you.

Vegetables in Oil

A variety of vegetable-in-oil products are currently being commercially produced. There is a potential risk of botulism with any low-acid product stored in a low-oxygen environment such as oil.

The highest risk of botulism toxin production is when a moist low-acid vegetable is stored in oil at room temperature. This high risk is because the key factors for botulism are when a low acid food has sufficient moisture for Clostridium botulinum to grow and the temperature is warm enough for rapid growth of the bacteria.

To control bacterial growth, low moisture, acidification, or temperature control is necessary. Commercial garlic-in-oil mixtures are acidified to prevent bacterial growth. Homemade infused oils must use dried foods, acid, or refrigeration to prevent bacterial growth.
**Products that Need to be Refrigerated**—Fresh vegetables and herbs make good flavored oils. These products should not be stored at room temperature. Store in the refrigerator for up to 3 weeks; freeze for longer storage. Outlined below are steps to prepare infused oil using fresh herbs and vegetables:

1. Wash all fresh herbs and/or vegetables thoroughly.
2. Cut or chop vegetables, if desired. Add to oil.
3. Discard after three weeks, or if gas bubbles or foul odor develop.

Pesto (an uncooked seasoning that includes fresh basil, garlic, pine nuts, and oil) must be refrigerated. Do not store longer than 3 weeks in the refrigerator. Freeze for longer storage.

**Products that May be Stored at Room Temperature**—Dried vegetables or herbs in oil can be stored at room temperature (if thoroughly dried), but refrigeration will delay rancidity.

Canned vegetables marinated in an oil-vinegar mixture must be prepared following a tested recipe.

All vegetables must be completely acidified with vinegar or lemon juice for these recipes to be safe for canning. The only safe way to process marinated vegetables is to carefully follow a recipe that has been tested for pH.

Three tested recipes for marinated vegetables have been developed for the *USDA Home Canning Guide*. These recipes are for Marinated Peppers, Marinated Whole Mushrooms (also in PNW 355) and Pickled Three-Bean Salad (also in PNW 355). **Do not use any other recipes for marinated vegetables and do not change the tested recipes in any way.**

Heat penetration in oil is slower than in water. The recipes for marinated vegetables use small jars. This allows for adequate heat penetration in these products. Larger jars should not be used for canning marinated vegetables.
# Storing Garlic

## Botulism Warning

**Botulism Warning**—Garlic is a low-acid vegetable. As with all low-acid vegetables, garlic will support the growth of *Clostridium botulinum* when given the right conditions. These conditions include improper home canning and improper preparation and storage of fresh herb and garlic-in-oil mixtures. Moisture, room temperature, lack of oxygen, and low-acid conditions all favor the growth of *Clostridium botulinum*.

## Harvesting Garlic

**Harvesting Garlic**—If you grow your own garlic, it is important to let it mature after harvest. Spread garlic on newspapers out of sunlight in a well-ventilated place to cure for 2 to 3 weeks or until skins are papery.

## Storage at Room Temperature

**Storage at Room Temperature**—Store in a cool, dry, well-ventilated place in well-ventilated containers, such as mesh bags. Storage life is 3-5 months.

## Freezing Garlic

**Freezing Garlic**—Garlic can be frozen in any of the following ways:

- Grind or chop the garlic, wrap tightly and freeze. To use, grate or break off the amount needed.

- Freeze the garlic unpeeled and remove cloves as needed.

- Peel the cloves and puree them with oil in a blender or food processor, using two parts oil to one part garlic. The puree will stay soft enough in the freezer to remove portions as needed. **Do not store this mixture at room temperature.**

## Drying Garlic

**Drying Garlic**—Dry only fresh, firm garlic cloves with no bruises. To prepare, separate and peel cloves. Cut in half lengthwise. No pretreatment is necessary. Dry at 140°F for two hours, and then reduce heat to 130°F until completely dry or crisp.

- To make garlic powder from the dried garlic, blend the garlic in a blender until fine. To make garlic salt from the dried garlic powder, combine four parts salt and one part garlic powder and blend 1 to 2 seconds. If blended longer, the salt will be too fine and will cake.

## Garlic Stored in Wine or Vinegar

**Garlic Stored in Wine or Vinegar**—Peeled cloves may be submerged in wine or vinegar and then stored in the refrigerator. The garlic/liquid mixture should keep for about 4 months in the refrigerator. Discard both the garlic and the liquid if there are signs of mold growth or yeast on the surface of the wine or vinegar. The garlic...
Some Common Questions

Q. **I want to can quick breads to give as gifts. Do you have a recipe?**
A. Several universities (Utah State and Kansas State) have *unsuccessfully* attempted to develop recipes for these quick breads canned in a jar. A fact sheet from Utah State University states that they were unable to develop a safe product. (The fact sheet can be read at http://extension.usu.edu/publica/foodpubs/canbread.pdf) The fact sheet also recommended that quick breads should be either fresh or frozen. Don’t can quick breads and don’t eat a home-canned quick bread if someone gives one to you as a gift.

Q. **The directions for my family mincemeat pie filling recipe are for canning the mincemeat in a boiling water canner. Is this safe?**
A. No, mincemeat pie filling should be pressure canned. The only tested recipe for canned mincemeat pie filling is on page 10 of PNW 361 *Canning Meat, Poultry and Game.*

Q. **What precautions should I take to assure that my children are not exposed to excess lead from china dishes?**
A. China that may be high in lead includes old pieces handed down from a previous generation, homemade or hand-crafted china, highly decorated multi-colored inside surfaces (that touch the food) and pieces with a corroded glaze. For questionable pieces of china, you can minimize risks by:
- Not storing food or drink in these pieces.
- Not serving highly acid food or drink in questionable china, especially to children.
- Not using a questionable piece for everyday use.
- Not heating or microwaving the piece, which speeds up the lead-leaching process.

Q. **I want to make flavored vinegar. Where can I find information?**
A. Flavored vinegars are made by adding herbs, spices, vegetables or fruits to vinegar. A fact sheet “Flavored Vinegars” has detailed instructions and is available at www.fcs.vga.edu/pubs/current/98501.html.