While this document contains many links to websites and other files for your learning pleasure, ***all of the answers to the reappointment quiz are in this study guide – use only this document as your reference for the questions.*** *Allow yourself 2 hours of continuing education to study and take the quiz.*

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Food Preservation

Excerpt from MFP Training Manual, Chapter 1 (The Basics of Food Spoilage and Preservation)
Date

Long-term storage of foods requires attention to maintaining product safety as well as product quality. Therefore, preservation treatments are designed to control the growth of pathogenic organisms in addition to **spoilage organisms**.

To decide which method of preservation is best, first check to see that approved guidelines exist for the type of food you want to preserve. Not all foods can be safely preserved in the home environment, or by all preservation methods. Consider too how you want to store the finished product and the equipment you have available. A final question is how your family will like the product. Regardless of the process you choose, follow directions carefully for a product that is both top quality and safe.

Methods

The primary methods of preserving food are outlined below.

Refrigeration

- Slows the growth of microorganisms (40°F and below).
- Slows the action of enzymes.
- Protects from moisture loss when combined with proper packaging.

Freezing

- Prevents the growth of microorganisms, but does not kill them.
- Slows, but does not stop enzymatic activity. Therefore, enzymes in most fresh vegetables must be inactivated by blanching before freezing.
- Requires a steady 0°F food temperature for best keeping quality.
- Must be combined with packaging that is moisture-proof, sealable, and impermeable to oxygen to prevent further quality loss.

Canning

- Heat processing destroys pathogenic and spoilage microorganisms sufficiently to allow long-term storage of food at room temperature.
    - Boiling water temperatures are sufficiently high for canning foods that are naturally acid enough and those that have been properly acidified.
    - Pressure canning is required to safely process foods that may support the growth of spore-forming bacteria.
    - The canning process vents oxygen from the jar, creating an airtight **vacuum seal** upon cooling.
    - Absence of oxygen prevents the growth of molds and some yeast, but invites the growth of anaerobic bacteria.
- Additional ingredients such as salts, sugars, and acids are secondary measures beyond heat that can enhance the safety of home-canned foods.

Sweetening and Acidifying Jellies and Jams

- Addition of sugar and acid ties up free water and lowers pH.
- Must be combined with processing in a boiling water canner, freezing, or refrigeration to prevent the growth of spoilage organisms.

Pickling and Fermenting

- Inhibits or prevents the growth of microorganisms using naturally-produced or added acids.
- Fermenting uses bacteria to produce **lactic acid** and lower the pH in products such as fermented pickles, kimchi, and sauerkraut.
- Pickling adds vinegar (**acetic acid**) to lower pH in fresh-pack pickles and other acidified products.
- Must be combined with processing in a boiling water canner to destroy spoilage organisms and create a vacuum seal on the jar to prevent recontamination during storage.

Drying

- Removes water, prevents the growth of microorganisms, and controls enzyme activity.
- Must be combined with packaging in oxygen- and moisture-proof containers to prevent oxidation of flavors and moisture gain.

Salting

- Chemically binds with water, inhibiting the growth of some bacteria.

Play it Safe: Changes and Substitutions to Home Food Processing Recipes

UW Extension, 2015

The safety of the food that you preserve for your family and friends is important to you. The University of Wisconsin-Extension supports using up-to-date, research-tested recipes so that you know that the food that you preserve is both safe and high in quality. Here are a few quick tips on changes and substitutions that will keep your home preserved food safe to eat.

Canning Fruits

Sugar is added to canned fruits help preserve color, help firm texture, and for flavor.

- Choose a light fruit juice such as white grape juice for canning if you wish to **reduce sugar** in home-canned fruit.
- You may safely **eliminate sugar** altogether when canning fruits at home, if you prefer. However, fruit canned in water is generally considered unappealing, and will spoil more quickly once opened.
- There are no tested recipes for using sugar substitutes such as Sucralose® in home canning. Refer to the manufacturer for directions for home canning using a sugar substitute.

Canning Meat

Meat is low in acid and must be canned in a pressure canner.

- You may add **a small amount of seasoning, onions, or garlic** when home-canning meat without changing the processing time.
- Canned meat products must **never** be thickened with flour or cornstarch; rice, pasta or barley must **never** be added; and fat must **not** be added – any of these changes can result in an unsafe product.
- Only add meat when called for in a tested recipe. For example, don't add meat to spaghetti sauce unless the recipe allows this addition.

Canning Salsa

Salsa is a mixture of high-acid ingredients such as fruit or tomatoes, and low-acid ingredients like peppers and onions.

- You may **substitute** sweet peppers for hot peppers, and vice versa, measure for measure when preparing home-canned salsa. You may also substitute colored peppers for green ones!
- You may **add tomato paste** to thicken any tested salsa recipe without changing the processing time. [Hint: if salsa is thinner than you like, simply drain prior to serving!]
- You can **reduce** the sugar or salt in any tested salsa recipe.
- You may **reduce** the amount of low-acid ingredients such as onion, celery, or green peppers in a tested salsa recipe. But you may **not substitute** corn, black beans, etc. for ingredients that are being reduced.
- You may **not change or reduce** the type (or amount) of acid in a tested recipe. Add a bit of sugar if the salsa is too tart.
- You may **refrigerate or freeze** a salsa recipe that can't be safely canned. If refrigerated, store for up to 2 weeks.

Canning Tomatoes

Tomatoes are the most popular home-canned item. Acid is added to home-canned tomatoes to ensure safety. Many tested recipes allow you to choose either pressure canning or boiling water/steam canning for tomatoes.

- Add ¼ teaspoon **citric acid**, or 1 Tablespoon **bottled lemon juice** to each pint of home-canned tomatoes. Add ½ teaspoon citric acid, or 2 Tablespoons bottled lemon juice per quart. Add a bit of sugar, is desired, to offset any changes in flavor.
- You may safely reduce or eliminate salt in all home canned tomato recipes.
- Where instructions are given for canning pints at 5 or 6 psi and quarts at 10 or 11 psi, you may safely **process pints at the higher pressure** for the length of time given for quart jars.
- **Don't add low-acid ingredients** such as peppers, onions, or celery to home-canned tomato products unless specifically allowed in a tested recipe.
- **Never thicken** tomato products with flour or cornstarch in an attempt to create a condensed soup.

Canning Vegetables

Vegetables are low in acid and must be canned in a pressure canner.

- You may create **vegetable mixtures** as long as there is a tested recipe for each vegetable that you are combining **and** you follow the processing time for the vegetable that has the longest time listed.
- You may add **a small amount of garlic** (up to 1 clove per jar) to canned vegetables without impacting the processing time.
- **Do not thicken** canned vegetables with flour or cornstarch, or add rice, pasta or other starchy ingredient, an unsafe product will result.

Homemade Pickles & Relishes

One of the fastest growing areas of the food industry is in pickled products. The time is now to try making some of these tasty products yourself! Pickles are processed in a boiling water or steam canner.

- You may safely **reduce sugar or salt** in any tested quick-process pickle. The amount (and type) of salt listed in a recipe for sauerkraut or genuine dill (crock) pickles can not be changed!
- You can **rinse sauerkraut** prior to serving and reduce the amount of sodium by 30-40%.
- You may safely **substitute** grocery store cider vinegar (5% acetic acid) for white vinegar (5% acetic acid), and vice versa. Do not use other types of vinegar such as wine vinegar or homemade vinegar.
- You may **add a clove of garlic or a small dried hot pepper** to any pickle recipe without impacting the processing time.
- You may **substitute zucchini or summer squash** for cucumber in any relish recipe. You may substitute English or grocery store cucumbers for pickling cucumbers, but the quality of the product may be inferior.
- You may **refrigerate** a pickle recipe that can't be safely canned. If refrigerated, store for up to 2 weeks.

Making Jams and Jellies

Nothing says 'summer' like the delicious taste of homemade jam and jelly. Jams and jellies are processed in a boiling water or steam canner.

- You may **safely add** a small amount (1 teaspoon or less) of herb or other flavoring to a fruit jam or jelly recipes; e.g. when making basil strawberry jam or vanilla cherry jelly.
- **Substitute** peaches for nectarines, or apples for pears with the same tasty results.
- You may use **unsweetened**, frozen or canned fruit in place of fresh in any jam or jelly recipe. Do not use pre-sweetened fruit.
- You may use **honey** in making jams or jellies. In product made with pectin, replace up to 1 cup sugar with 1 cup honey for every 6-pint recipe; be sure to adjust the amount of liquid in the recipe. In recipes with **no added pectin**, honey can replace up to ½ the sugar; decrease the amount of liquid by the amount of honey added.
- Use **6 Tablespoons bulk pectin** for every box!
- Follow a recipe tested for the **type** of pectin (regular, low-sugar, no-sugar) and **form** (powdered or liquid) that you have. Don't try substitutions, the product will fail to set.
- **Don't double** jam and jelly recipes….unless you like syrup! If you want to make larger batches, try using Clear-gel (modified corn starch) as a thickener rather than pectin.
- Don't worry about failures! Unset jam or jelly makes great pancake or ice cream topping, or can be used in cooking as a meat glaze, etc.

The Case for Bottled Lemon Juice in Canning

https://blogs.extension.iastate.edu/answerline/2021/08/03/the-case-for-bottled-lemon-juice-in-canning/

Many home preservers often wonder why tested and USDA approved canning recipes call for bottled lemon juice. This is especially true when it involves tomatoes and making jams. Why not fresh squeezed lemon juice?

A USDA RECOMMENDATION

It is a USDA recommendation that bottled lemon juice be used. And consistent with the recommendation, reputable canning sources will agree that the best source of lemon juice for canning is commercially bottled lemon juice, as opposed to the juice of a fresh lemon. The reason for the recommendation is that bottled lemon juice has been uniformly acidified or standardized per FDA regulations: "lemon juice prepared from concentrate must have a titratable acidity content of not less than 4.5 percent, by weight, calculated as anhydrous citrus acid." With a guaranteed pH (5 percent[2]), there is a consistent and known acid level which is essential for the critical safety margin in canning low-acid foods and for making jams gel properly.

Acid strength is measured on the pH scale. The scale starts with strongest acid at 1 and declines in strength as the number increases to 14, the strongest alkali. The lower its value, the more acid in the food. The neutral point is 7, neither acid nor alkaline. The amount of acid in canned food is critical to deter the growth of micro-organisms and insure that the food is safe. Foods with a pH less than or equal to 4.6 are labeled "high-acid" foods. Those with a pH greater than 4.6 are "low- acid." This distinction is very important because only high-acid foods can be processed safely in a boiling water

bath. Low-acid foods must always be processed in a pressure canner; if not, they can support the growth of the potentially harmful bacterium, Clostridium botulinum.

The pH of fresh lemon juice is inconsistent due to variety, maturity, weather conditions during growth, soil, fertilizer, rootstock, and storage conditions. There are even variations in acidity within a single variety. Lemons grown in hot climates tend to be less acidic than those grown in cooler climates. Lemon juice contains both ascorbic and citric acid; since ascorbic acid is destroyed by heat, only citric acid is measured. The average acid level of fresh lemon juice is about 5 percent, thus the "natural strength" labeling on the lemon juice bottle.

While acid consistency is the reason for using bottle lemon juice, bottled lemon juice is made from concentrate and preserved with sulfites. For people allergic to sulfites, bottle lemon juice may be a health hazard. If you or family members have a sulfite sensitivity or allergy, substitutes for bottled lemon juice include bottled lime juice (not Meyer or key lime) or frozen lemon juice (not lemonade) in equal amounts as bottled lemon juice or citric acid in appropriate ratios. Citric acid, sold as a white crystalline powder and not the same as ascorbic acid, is available where canning supplies are sold. It can safely be used to acidify foods if used correctly. Vinegar should not be used to replace bottled lemon juice unless a tested recipe allows it because white vinegar is weaker in acid strength. Equal amounts of bottled lemon juice can be used to replace white vinegar in recipes calling for vinegar, but not the reverse. When vinegar is an acceptable substitute, it will affect the flavor of the food. Never change the amount of acid, dilute with water, or substitute acid sources unless the recipe specifically allows you to do so. Aspirin should not be used as a substitute in canning. It cannot be relied on to lower pH or prevent spoilage.

Acidifying Tomatoes For Safe Canning

When canning products with an unknown pH as acid foods, they must be acidified to a pH of below 4.6 with lemon juice or citric acid. Tomatoes, usually considered an acid food, and figs are two examples where the pH values hover near or above 4.6. When acidified with lemon juice or citric acid, they may be processed as acid foods making them safe for boiling water bath or atmospheric steam processing. Directions from the National Center for Home Food Preservation for acidification of tomato products **t**o insure safe acidity in whole, crushed, or juiced tomatoes state: **Use 2 tablespoons of bottled lemon juice or 1/2 teaspoon of citric acid per quart of tomatoes. For pints, use 1 tablespoon bottled lemon juice or 1/4 teaspoon citric acid.** Acid can be added directly to the jars before filling with product. Sugar may be used to offset the acid taste, if desired. 4 tablespoons of a 5 percent acidity vinegar per quart may be used instead of lemon juice or citric acid. However, vinegar will likely cause undesirable flavor changes. Tomato salsas must also be acidified. To get an idea of how much difference bottle lemon juice makes, see Table 1 in the publication *Why Add Lemon Juice to Tomatoes and Salsas Before Canning?* by North Dakota State University.

pH Matters with Jams

While many factors are involved in getting jams to "set" or gelatinize, pH plays a key role. When fruit is cut and heated with sugar, pectin strands are released from the fruit cells. The freed pectin strands repel each other because they carry a negative electric charge. Lemon juice lowers the pH of the jam mixture and neutralizes the negative charges on the strands of pectin allowing them to move together into a network to "set" the jam. The optimal pH for gelatinization is between 2.8 and 3.5. The best way

to achieve this level of acidity is to use commercially bottled lemon juice. A second reason for using bottled lemon juice in jam recipes is to prevent the growth of bacteria and insure safe canning. With a lower pH, jams can be processed in a boiling water bath for a small amount of time dependent on altitude.

Whether using bottle lemon juice to acidify tomatoes or getting jam to "set," bottled lemon juice has a 'best used by' date. Keeping the product in the fridge may extend its date but it is best to use a fresh bottle when canning or making jam to insure that the juice is at its best.

The verdict is in. The best way to insure a safe or desired pH for canning low-acid foods or jam gelatinization is to go with a commercially bottled lemon juice. Bottled juice is controlled and standardized with the acid content assured and more reliable than fresh lemons. Fresh lemons, however, make excellent lemonade!

When the Power Goes Off

https://www.clemson.edu/extension/food/canning/canning-tips/15power.html

A power outage may occur during an ice/snowstorm, hurricane, tornado or flood or may simply be caused by work being done on electric lines. Whatever the cause, the following recommendations apply to food safety in power outages.

Safety Recommendations

Use a Thermometer: Keep an appliance thermometer in the refrigerator and freezer at all times to see if food is being stored at safe temperatures (34 to 40°F for the refrigerator; 0°F or below for the freezer). Temperature is critical to the safety of foods in the refrigerator and freezer. Most foodborne illnesses are caused by bacteria that multiply rapidly at temperatures above 40°F.

Leave the Freezer Door Closed: A full freezer should keep food safe about two days; a half-full freezer, about a day. If freezer is not full, group packages together quickly. Group meat and poultry to one side or place on separate trays to keep their juices from contaminating other foods if they thaw. Then avoid opening the freezer door to prevent the cold air from escaping.

Add bags of ice or dry ice to the freezer if it appears the power will be off for an extended time. Use three pounds of dry ice per cubic foot of freezer space. The temperature of dry ice is -216°F, so use rubber gloves or tongs when handling it. Wrap dry ice in brown paper for longer storage and separate it from direct food contact with a piece of cardboard. Fill a partially empty freezer with crumpled newspaper to cut down on air currents which cause dry ice to dissipate. Provide adequate ventilation for carbon dioxide in areas where dry ice is used. Do not cover air vent openings of freezer.

Refrigerated Items: These foods should be safe as long as the power is out no more than four to six hours. Discard any perishable food that has been above 40°F for two hours or more and any food with an unusual odor, color or texture. Leave the door closed; every time it is opened, cold air escapes and causes the foods inside to warm to unsafe temperatures. If it appears the power will be off more than six hours, transfer refrigerated perishable foods to an insulated cooler filled with ice or frozen gel packs. Keep a thermometer in the cooler to be sure the food stays at 40°F or below.

Never Taste Food to Determine Its Safety: Some foods may look and smell fine. However, if they have been at room temperature longer than two hours, bacteria that because foodborne illness can begin to multiply very rapidly. Some bacteria produce toxins which are not destroyed by cooking and can cause illness.

Power Out Chart

Use the following chart to decide which foods are safe to eat when the power is restored.

Discard: The following foods should be discarded if kept over two hours at above 40°F.

- Meat, poultry, fish, eggs and egg substitutes - raw or cooked.
- Milk, cream, pasteurized yogurt and soft cheese
- Casseroles, stews or soups
- Lunch meats and hot dogs
- Creamy-based salad dressings
- Custard, chiffon or cheese pies
- Cream-filled pastries
- Refrigerated cookie dough
- Discard open mayonnaise, tartar sauce and horseradish if above 50°F for over eight hours.

Save: The following foods should keep at room temperature a few days. Still, discard anything that turns moldy or has an unusual odor.

- Butter or margarine
- Hard and processed cheeses
- Fresh fruits and vegetables
- Dried fruits and coconut
- Opened jars of vinegar-based salad dressings, jelly, relish, taco sauce, barbecue sauce, mustard, ketchup, olives and peanut butter
- Fruit juices
- Fresh herbs and spices
- Fruit pies, breads, rolls and muffins
- Cakes, except cream cheese-frosted or cream-filled
- Flour and nuts

Refreeze: Thawed foods that still contain ice crystals may be refrozen. Thawed foods that do not contain ice crystals but have been kept at 40 °F or below for two days or less, may be cooked, then refrozen or canned.

Removing Odors

If food has spoiled in a refrigerator or freezer because of a power failure, undesirable odors can develop. To eliminate odors, remove the food and wash the inside of the freezer with one tablespoon of baking soda in a quart of tap water, or with one cup of vinegar in a gallon of tap water. Let the surface dry.

If the odor still persists, use activated charcoal. This type of charcoal is extra dry and absorbs odors more quickly than cooking-type charcoal. It can be purchased at a drug store or pet supply store. To use it, unplug the freezer. Put the charcoal in pans or on paper in the bottom of the freezer for several days. If the odor remains, put in new charcoal. When the odor is gone, rinse and dry the inside of the freezer. Turn on the freezer and it is ready for food. When odor gets into the freezer's insulation, write the manufacturer for its suggestions for solving the problem. However, sometimes nothing can be done.

Presto Canner Usage Instructions

https://www.gopresto.com/uploads/01755_01781_72_719J_Eng_Web_Instructions[2].pdf

IMPORTANT: Do not attempt to use your canner before carefully reading these instructions. Follow these step-by-step instructions for pressure canning in your canner. Prepare food according to the processing procedures in specific recipe.

1. Be sure your canner is thoroughly cleaned and working properly:
    - Before each canning season, have the dial gauge checked for accuracy (see page 8).
    - Check the sealing ring and overpressure plug. Replace both at least every 3 years, but always when they become hard, deformed, cracked, worn, pitted, or unusually soft. Make sure the overpressure plug is seated properly in the cover.
    - Check the white gasket on the air vent/cover lock. It should be intact, without cracks or tears. Be sure the 2 metal parts of the air vent/cover lock are securely fastened.

2. If canning on an electric smooth-top range, refer to instructions for canning in the owner's manual for your range. Always clean the stovetop with a cooktop polishing cream, according to the range manufacturer's instructions, before and after canner use. In addition, to avoid scratching the ceramic glass surface of the smooth-top range, check the bottom of the canner to be sure it is clean and free of debris and does not have any nicks or scratches.

3. Check Mason jars for nicks, cracks, and sharp edges. Check screw bands for dents or rust. Use only jars, lids, and screw bands in perfect condition so an airtight seal may be obtained. Wash and rinse jars, lids, and screw bands. Pour hot water into jars and set aside until needed. Follow closure manufacturer's directions for preparing lids.

4. Select fresh, firm food. Sort food according to size. Clean food thoroughly. Prepare according to specific recipe. Fill hot jars promptly with food and liquid to recommended level. Allow ½-inch headspace for fruits. Most vegetables and meats require 1-inch headspace due to expansion during processing. Work out air bubbles with a clean nonmetallic spatula. Wipe sealing edge clean with a damp cloth. Adjust screw bands according to closure manufacturer's directions.

5. Place 3 quarts of hot water (for hot packed foods the water can be heated to 180°F, which is not quite boiling) and canning rack in canner. To prevent water stains on jars, add 2 tablespoons white vinegar to water in canner. Always use canning rack as jars may break if set directly on bottom of canner. NOTE: 3 quarts of water are needed regardless of how many jars are being canned.

6. Place filled jars on canning rack immediately after each jar is filled.

7. Hold the cover up to the light and look through the vent pipe to be certain it is clear before placing the cover on the canner. If it is clear, proceed to step 8. If it is blocked, clean the vent pipe and vent pipe nut with a small brush or pipe cleaner.

8. Place the cover on the canner, aligning the **V** mark on the cover with the inverted **V** mark on the body handle. Press down on the cover handles to compress the sealing ring and turn the cover in the direction indicated to close (clockwise) until the cover handles are above the body handles. Do not rotate the cover beyond this point.

9. Position the canner on a level burner and range only. Use on a tilted burner or range may interfere with the operation of the pressure regulator. For electric coil and smooth-top ranges, use the element that most closely matches the 8-inch diameter of the canner bottom. This is the portion of the canner bottom which comes in contact with the element.

   CAUTION! Do not use on any outdoor LP gas burner or a gas range over 12,000 BTU's. Using too large of an element or over 12,000 BTU's may soften the canner causing the bottom to warp. It may also result in property damage and/or personal injury.

   Using a high setting, heat the pressure canner until a steady flow of steam can be seen, heard, or felt coming from the vent pipe. Exhaust air from the canner for 10 minutes by allowing steam to flow from the vent pipe. Reduce heat, if necessary, to maintain a steady, moderate flow of steam.

10. Place the pressure regulator on the vent pipe. If heat was reduced for exhausting, adjust to a relatively high setting and heat canner. As pressure develops in the canner, the air vent/cover lock will lift and lock the cover on the canner. The air vent/cover lock is a visual indicator of the presence of pressure. When in the up position, there is pressure in the canner; when in the down position, there is no pressure in the canner. Also, as pressure builds, the pointer of the gauge should move across the face. If the pointer does not move and the regulator begins rocking, see step 11 below to process at 15 pounds of pressure. Replace the gauge before using the canner again.

11. Continue heating until the pressure dial gauge registers the correct pressure. Adjust the heat to maintain the correct pressure on the dial gauge for the duration of the processing time. If you are canning at 15 pounds of pressure, the pressure regulator may begin to rock before the dial gauge registers it, indicating 15 pounds of pressure has been reached inside the canner. Should this happen, ignore the dial gauge and lower the heat to maintain a continuous, slow rocking motion of the pressure regulator for the duration of the processing time. To watch a video of a regulator maintaining a slow, steady rocking motion, visit www.GoPresto.com/ppc/rocking.

12. Processing time begins when the correct pressure has been reached. If pressure drops below desired setting, it will be necessary to bring pressure to the correct setting and begin processing countdown from the beginning for the full amount of time. Helpful Hint: To more easily maintain pressure, it may be beneficial to reduce the heat when the pressure dial gauge registers 1½ to 2

pounds less than the desired pressure. However, do not begin the processing countdown until correct pressure is reached.

13. At the end of processing time, turn burner to OFF and remove canner from heat source. NOTICE: Lift pressure canner to remove it from burner. Sliding any cookware may leave scratches on stovetops.

14. Let pressure drop of its own accord. Do not attempt to speed the cooling of the canner, which can cause jar breakage, liquid loss from the jars, and other problems. Pressure is completely reduced when the air vent/cover lock and overpressure plug have dropped and no steam escapes when the pressure regulator is lifted. Do not use the pressure dial gauge as an indicator for when pressure is completely reduced.

15. When pressure has been completely reduced, remove the pressure regulator from the vent pipe and let the canner cool for 10 minutes. Do not remove the pressure regulator until pressure is completely reduced and the air vent/cover lock has dropped. Always remove the pressure regulator before opening the cover.

16. To remove the cover, turn it counterclockwise until it hits the stop tab. Cover handles will be beyond the body handles. CAUTION! If the cover seems to stick or is hard to turn, do not force it open. Sticking may indicate that there is still pressure inside the canner. If in doubt about pressure being completely reduced, let the canner stand until cool before removing the cover.

17. Lift canner cover toward you to keep steam away from you when opening.

18. Remove jars from canner. Set jars upright on board or cloth, away from drafts. Allow jars to cool naturally for 12 to 24 hours before testing seal. See page 5 for "After Processing" information. NOTICE: When processing consecutive batches, be sure to check the water level in the canner between batches. Add water, if necessary, to keep water at the 3-quart mark.

19. When canning is complete, allow canner to cool completely before cleaning.

Canner Storage: Store canner in a dry place at temperatures above freezing with the cover inverted on the canner body. Exposure to temperatures below freezing can damage the gauge. Storing the canner with the cover locked on may cause unpleasant odors and deform the sealing ring. Canner must be completely dry before storing

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Benefits of Fermenting Fruits and Vegetables

UC Home Preservation and Storage Publications at ucfoodsafety.ucdavis.edu

What is a fermented food?

Fermented foods and beverages are made through desired microbial growth and enzymatic conversions of food components.

Improved preservation. Fermented fruits and vegetables can be kept for months in the refrigerator before eating.

Taste. Fermented foods possess a unique flavor profile, due to the balance of sugar, bacterial produced acid, and volatile flavor compounds.

Safety. Properly fermented fruits and vegetables will create an environment within the food that is less favorable for foodborne pathogens to survive and proliferate. This includes an increase in acidity level to achieve a pH below 4.6.

Nutrition. Prolonging the shelf life of perishable fruits and vegetables through fermentation results in more retention of naturally occurring vitamins in the final product compared to other processing methods, such as heat treatment. Moreover, fermentation can result in the generation of vitamins and other bioactive compounds not found in the fresh fruit or vegetable.

What is the difference between probiotics and the microbes in fermented foods?
Probiotics are live microorganisms that when consumed in specific amounts confer a health benefit on the host. Probiotics are defined at the sub-species, strain level and require evidence from human studies.

Fermented fruits and vegetables may contain live microorganisms at the time they are consumed but these microorganisms are undefined at the strain level and should not be called probiotics.
Health benefits. Fermenting fruits and vegetables results in the modification and synthesis of nutrients associated with good health. During fermentation, the microorganisms responsible for fermentation may remove unwanted compounds (e.g. sugars that cause flatulence), modify compounds to make them more bioavailable (e.g. phenolic acids), and synthesize new products (e.g. B vitamins). Consumption of fermented foods can support immune responses and sustained microbial diversity of the gut. This can reduce inflammation of the gut and provide resilience against some illnesses.

Safely Ferment Fruits and Vegetables at Home

UC Home Preservation and Storage Publications at ucfoodsafety.ucdavis.edu

FERMENTED FRUITS AND VEGETABLES
DEFINED: Fermented fruits and vegetables are foods made through desired microbial growth and enzymatic conversions of food components. Most fruit and vegetable fermentations rely on the growth of lactic acid bacteria and are sometimes known as lacto-fermentations.

Food Safety Risks

Biological Hazards

Clostridium botulinum

- Botulism can occur if fermentation is not successful and acid levels are low
- These bacteria grow in oxygen-free conditions in low acid foods (foods with a pH above 4.6)
- The growth of beneficial microbes during fermentation will produce acid

- The production of sufficient acid will inhibit the growth of *Clostridium botulinum*

Enteric pathogens

- Includes certain bacteria (Shiga toxin producing *Esherichia coli* and *Salmonella* spp.), viruses, and parasites that cause gastrointestinal diseases
- Pose a risk if proper sanitation and fermentation practices are not followed

Chemical Hazards - Biogenic amines

- Produced by some lactic acid bacteria
- Can cause allergic responses and may have toxicity when present at high levels

Physical Hazards - Carbon dioxide (CO_2)

- In an airtight container, gas produced by fermentation may cause breakage

Fermentation Success Key #1

Proper sanitation. This includes thorough washing of hands prior to fermentation. Wash all containers and utensils using soap and potable water. Sanitize all equipment after washing.

Fermentation Success Key #2

Use high quality ingredients. Start with fresh fruits and vegetables that have not started to decay. Produce that has started to spoil may not ferment due to the presence of high numbers of undesirable microorganisms.

Fermentation Success Key #3

Follow a researched and tested recipe. To find reliable information for safe fermentation of fruits and vegetables look at University Extension websites and publications. If you are unsure about the safety of a fermented product, "when in doubt throw it out."

"QUICK" PICKLES ARE NOT FERMENTED: "Quick" pickles are produced by the addition of an acid (like vinegar) and not through microbial growth. These "quick" pickles have different risks and safety considerations compared to fermented fruits and vegetables.

Preparing Fermented Fruits and Vegetables at Home

UC Home Preservation and Storage Publications at ucfoodsafety.ucdavis.edu

The Fermentation Process

Fermented fruits and vegetables are made by a process that requires microbial growth and enzymatic activities. Fermentation occurs within days, during which microbes (bacteria or fungi) present on the vegetables or fruits grow resulting in changed texture and taste. Bacteria belonging to a group called lactic acid bacteria (LAB) can occur naturally on the surfaces of fruits and vegetables. These LAB convert sugars present into other compounds such as lactic acid and carbon dioxide. Microbes harmful to human health (i.e. pathogens) that produce toxic compounds or cause infections do not survive well in the salty, acidic, low oxygen environment created during fermentation. Adding salt into the fermentation at a weight of 2-10% is important to prevent growth of these harmful microorganisms. The pH must also be below 4.6 to prevent botulism. After fermentation the fruit and vegetables should have higher acid and less sugar with a softer consistency than when raw.

Setting Up For Success

Clean and sanitize all equipment and utensils to minimize risk of contamination. Use fresh vegetables and fruits with no signs of spoilage; using these may lead to failed ferments.

Create a brine by adding salt directly to vegetables or fruits or by dissolving salt in water and adding to the fermentation vessel. Keep ingredients covered by brine to promote LAB growth and minimize spoilage. This can be accomplished using a weight.

Generate a low oxygen environment by using an exhaust valve (or airlock) on the lid or cap. This will allow carbon dioxide gas produced to escape without letting too much oxygen into the vessel.

Common issues with fermented fruits and vegetables

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Controlling growth of mold.
Proper cleaning and sanitation. Cleaning is the physical removal of debris using soap. Sanitation is the application of high heat or chemicals to inactivate undesirable microorganisms. Sanitation cannot be achieved on equipment that is not clean.

Ensure all the ingredients stay submerged. All produce should be submerged in the brine liquid. Weights can be used to keep the produce submerged.

Keep a lid on it. It is important to keep the fermentation away from air. The lid should be applied firmly, with no air gaps. The CO_2 should be released periodically by opening container or using an airlock.

Surface growth on the fermentation

Abnormal: **Mold**
Molds require oxygen to grow. Molds can grow on the surface of the ferment at the air interface. Mold growth can occur anytime during the fermentation process and is a sign of a failed fermentation. If you confirm mold growth on any part of a ferment, it should be immediately discarded. Mold is typically green, blue, brown, or black in color.

Note: White mold growth on sauerkraut stored outside brine, causing it to change color to purple instead of red due to an increase in pH and subsequent pigment color change (left). Excessive blue/green mold growth on the surface of olive brine (right). Photos courtesy of Erin DiCaprio.

***Normal:* Yeast**

White, grey, or pink films may form on the surface of fermenting fruits or vegetables. This film is typically yeast, often referred to by home fermenters as Kahm yeast. For some fermentations, such as the olives shown below, yeast growth is necessary for flavor and softening of the fruit. For other ferments, such as sauerkraut, yeast should be periodically removed during fermentation. Excessive yeast growth can lead to off flavors or textures and reduce acidity. The pH can be checked periodically to ensure it does not rise above 4.6.

Note: White yeast on surface of olive brine (left) and white/grey yeast on the surface of sauerkraut (right).Photos courtesy of Erin DiCaprio.

***Abnormal*: Putrid Smell**

A putrid smell indicates a failed fermentation. A fermented fruit or vegetable will smell pleasantly sour but not putrid. If a ferment smells noticeably spoiled, especially in combination with mold growth, it should immediately be discarded.

***Normal:* Fermentation vessel swelling or gas accumulation**

Some fermentation microbes make carbon dioxide gas during the fermentation process. This can be a good sign, but only if the pH stays below pH 4.6 Use a fermentation vessel with a breathable top or airlock if available. If not, periodically “burp” your vessel (i.e. open the lid) to release the gas.

Image Guidelines

UC Master Food Preserver Program

Images and photographs are integral to storytelling and can draw readers in, conveying meaning beyond a verbal description. Food preservation and usage in meals is a highly visual activity. A photo of a pot of jam, hands peeling an orange, or a juicy ripe tomato creates a range of emotions or feelings. Quality visuals depicting our volunteers, class activities, home kitchen projects, and meals using preserved food offer a behind-the-scenes look into, and an invitation of inclusion into the program that stock photography doesn't offer.

(This information serves as a guide to using images and videos as you develop content for the UC Master Food Preserver Program, and should not be taken as legal advice.)

Model Release Forms

UC Master Food Preserver volunteers should sign a model release form as part of their onboarding documents when joining the program. Records (digital or physical) must be kept and stored at the UC Cooperative Extension office. If a UC Master Food Preserver chooses not to sign a model release form, they are responsible for alerting photographers at events or removing themselves from being in images. Counties may also elect to add stickers or other identity markers on name badges to make it easier for photographers to identify volunteers who have chosen not to be photographed.

When do you need a model release for the public?
Videos or photographs taken in public places, for purposes of news or general information, typically do not require a model release form. If you would like to add an extra layer of protection for an event where images will be captured you may post signage giving notice of your intent to use images captured at an event. In general, when an individual's face is clearly recognizable or featured to endorse the UC Master Food Preserver Program, the best practice would be to obtain a signed model release form to be stored with the program's records.

Any videos or images that include minor children under 18 years of age, or person(s) in a medical or full-time care environment (senior care facility, veterans home, hospital, etc.) require a signed model release form.

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2022 Reappointment Quiz Questions

All of the answers to the reappointment quiz are in the 2022 study guide. This document is for study purposes. Take the quiz online at http://ucanr.edu/2022mfpquiz by June 30, 2022.

1	Food preservation treatments are designed to control the growth of: a. Only pathogenic organisms b. Only spoilage organisms c. Neither a or b d. Both a and b
2	All of the following are considerations in selecting the best method of preservation EXCEPT: a. Whether the original color of the food will be maintained b. Approved guidelines exist for the type of food to be preserved c. How the finished product will be stored d. Available equipment
3	Which of the following statements about freezing as a method of preservation is/are TRUE? X: Prevents the growth of microorganisms Y: Stops enzymatic activity a. Only X is true b. Only Y is true c. Neither X nor Y is true d. Both X and Y are true
4	The sweetening and acidifying of jellies and jams requires which of the following: a. Must be combined with processing in a pressure canner b. Addition of sugar ties up free water c. Addition of acid maintains a pH above 4.6 d. Use of color tinted jars prevents damage from sunlight
5	What substance must be added to fresh pack pickles to lower pH? a. Lactic acid b. Acetic acid c. Sugar d. Salt
6	Heat processing destroys pathogenic and spoilage organisms sufficiently to allow long term storage of food at what temperatures? a. 32 degrees F or less b. 40-55 degrees F c. 60-80 degrees F d. 85-100 degrees F

7	Which of the following is NOT a feature of drying as a method of food preservation? a. Removes water b. Prevents the growth of microorganisms c. Changes the taste d. Controls enzyme activity
8	A likely consequence of eliminating sugar when canning fruit is: a. Will spoil more quickly when opened b. Pathogenic organisms may grow more rapidly c. Food will develop a bitter taste over time d. Texture of fruit will improve
9	Which of the following can be safely added to meat without changing the processing time? a. Flour b. Barley c. Butter d. Garlic
10	Which of the following can be safely added to any tested salsa recipe in order to thicken it without changing the processing time? a. Cornstarch b. Tomato paste c. Pectin d. Tapioca
11	All of the following can be safely substituted for pickling cucumbers in relish EXCEPT: a. Zucchini b. Summer squash c. Acorn squash d. English cucumbers
12	In jelly and jam recipes with no added pectin, honey can replace what proportion of the sugar? a. 25% b. 50% c. 75% d. 100%
13	Small amounts of which of the following can be safely added to a fruit jam? a. Basil b. Vanilla c. Peppermint extract d. All of the above

14	People with sulfite sensitivity can always use which of the following as a substitute for bottled lemon juice EXCEPT: a. White vinegar b. Bottled key lime juice c. Citric acid d. Aspirin
15	The optimal pH for gelatinization of jellies and jams is: a. 2.8 to 3.5 b. 3.6 to 4.2 c. 4.3 to 5.0 d. 5.1 to 5.8
16	A full freezer with no power should keep food safe for how many days? a. One half day b. One day c. One and a half days d. Two days
17	Refrigerated food should be safe as long as the power is out no more than how many hours? a. One to three hours b. Four to six hours c. Seven to nine hours d. Ten to twelve hours
18	After a power outage of six hours, which of the following methods can be used to determine whether food is safe? a. Smell for “off” odor b. Cook for twice as long as package directions c. Look for discoloration in the product d. None of the above
19	Which of the following statements about using a Presto pressure canner is TRUE? X: If canning at 15 pounds of pressure, the pressure regulator may begin to rock before the dial gauge indicates 15 pounds of pressure. Y: If your dial gauge is not accurate or has not been tested, you can use the pressure regulator to process at 15 psi. a. Only statement X is true b. Only statement Y is true c. Both statements X and Y are true d. Neither statement X or Y is true

20	Food safety risks with fermented fruits and vegetables include which of the following hazards? a. Clostridium botulinum b. Enteric pathogens c. Carbon dioxide build up d. All of the above
21	Pathogens do not survive well in fermentation environments characterized by all of the following EXCEPT: a. Salt brine b. High Acid c. Low oxygen d. Low light
22	Which of the following are considered normal during fermentation? a. White yeast on surface of olive brine b. Accumulation of carbon dioxide inside the fermentation vessel c. Both a and b d. Neither a or b
23	If you create a PowerPoint presentation or use your personal pictures in a UC Master Food Preserver project, you maintain ownership of your work, while granting UC a non-exclusive license to use in perpetuity. a. Yes b. No
24	You can use any recipe you find in books and on the internet, but this only includes the ingredients and instructions, not pictures and descriptive text, which may be protected by a copyright. a. Yes b. No