THE UNIVERSITY OF GEORGIA
COOPERATIVE EXTENSION
College of Agricultural and Environmental Sciences
College of Family and Consumer Sciences

Food Safety & Canning Demonstration

Keith Mickler
University of Georgia
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Coordinator Floyd County

GEORGIA grown

— On The Farm —

Keith Mickler
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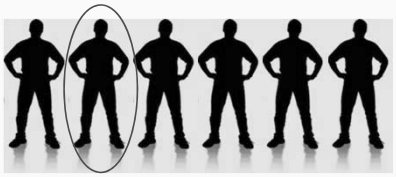
Foodborne illness in the US Each Year



- 1 out every 6 Americans
- 55,961 hospitalizations
- 3,000 deaths

Centers for Disease Control and Prevention, 2011

What is foodborne illness?

- Any disease caused by food that you eat
- Illnesses caused by bacteria like *Salmonella*, *Listeria*, *E. coli* O157:H7, *Yersinia*
- Illnesses caused by viruses like norovirus
- Illnesses caused by parasites like *Cryptosporidium*, *Cyclospora, Toxoplasma*
- Illnesses caused by parasitic protozoans like *Giardia*


Salmonella


Norovirus


E. coli O157:H7


Campylobacter


Listeria

What's the big deal?

Symptoms:

- Diarrhea
- Vomiting
- Nausea
- Abdominal pain
- Fever

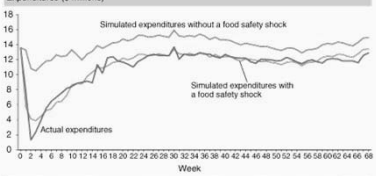
Complications:

- Reactive arthritis
- Guillain-Barre syndrome
- Spontaneous abortion, stillbirths
- HUS (kidney failure)
- TTP (blood clots, can lead to stroke)
- Death

Loss of business?

Bagged spinach expenditures plunged in response to FDA announcement, September 2006 - December 2007

Expenditures ($ millions)



Note: Week zero is the week prior to and week 1 is the week of the announcement. Since the data are weekly and the 5 days when there was no spinach on the market were spread over weeks 1 and 2, the figure does not show actual expenditures falling to zero.
Source: USDA, Economic Research Service model results.

Produce Associated Outbreaks

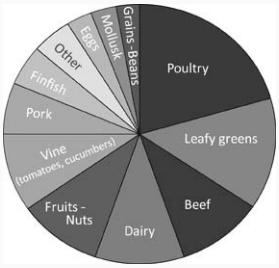
From 1996 to 2007:

Approximately 72 reported outbreaks of foodborne illness associated with about 20 fresh produce commodities, both domestic and imported

- 13 outbreaks were associated with tomatoes
- 11 outbreaks were associated with melons
- 24 outbreaks were associated with leafy greens such as lettuce and spinach

(lettuce, juice, sprouts, berries, green onions, nuts)

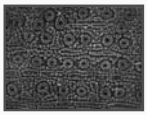
Causes of Foodborne Illness Outbreaks

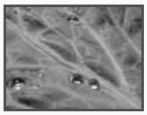


Causes of illness in 1,565 single food commodity outbreaks, 2003–2008
CDC. 2011. www.cdc.gov/foodborneburden/cdc-and-food-safety.html

The problem…

- Once produce is contaminated, it's difficult, if not impossible to remove contamination



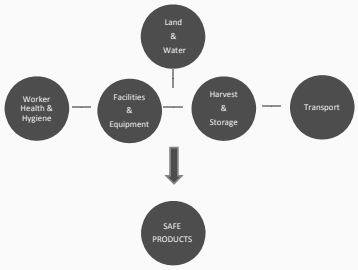


Courtesy of Dr. Joseph Frank, University of Georgia Dept. of Food Science and Technology

The goals…

- Don't let produce get contaminated with pathogens in the first place.
- Handle produce to minimize growth of harmful pathogens.

Farm Food Safety Model



Basic Steps to Keep Products Safe

Land & Water

- Use clean land and soil
  - Minimize human pathogens in the soil
  - Follow safe guidelines for manure use
  - Observe the specific waiting period between raw manure application and harvest
    - 90 day waiting period after application for crops that do not touch the soil – tomatoes, corn, etc.
    - 120 day waiting period for crops that touch the soil – carrots, turnips, etc.

Basic Steps to Keep Products Safe

Land & Water

- Use clean land and soil
  - Follow guidelines for proper composting
    - Pile size – beginning at 5x5x5 feet
    - Carbon to nitrogen ratio 25:1
    - Temperatures between 131 and 170°F
      - Maintain for 3 days in vessel
      - Maintain for 15 days in windrow or pile
        - » Turn at least 5 times
    - Use a thermometer and check the temperature

Basic Steps to Keep Products Safe

Land & Water

- Use clean water - Best practice
  - Well water preferred to surface water
  - Monitor water quality – test well water at least once a year
  - Use water that is safe to drink to rinse fruits and vegetables, etc.

Basic Steps to Keep Products Safe

Land & Water

- If you must use surface water to irrigate
  - Test frequently
  - Use drip irrigation rather than overhead irrigation
    - Best practice - wait two weeks after last application to harvest
  - Keep pets, farm animals and wild animals out of surface water used for irrigation

Basic Steps to Keep Products Safe

Worker Health & Hygiene

- Stress good personal hygiene in fields and packinghouses
  - clean clothes, no jewelry, no eating, no drinking, no smoking, etc.
- Teach workers how and when to wash their hands

Wet Hands | Apply Soap | Rub Hands Together at least 20 sec & Clean Nails | Rinse Hands | Dry With Clean Paper Towel | Use Towel to Turn Faucet & Open Door

Basic Steps to Keep Products Safe

Worker Health & Hygiene

- Exclude sick workers from handling produce
  - Diarrhea, vomiting, GI upset – wait until symptom free for at least 24 hours
  - Jaundice – require a doctor's release
  - Sore throat, etc. – reassign to non-food-handling, non-container-handling duties

Basic Steps to Keep Products Safe

Facilities & Equipment

- Provide adequate bathroom facilities
- Provide adequate handwashing facilities

Within ¼ mile from each worker in the field or packing shed

Basic Steps to Keep Products Safe

Facilities & Equipment

- Wash and sanitize work surfaces, packing bins, utensils, etc.
  - Pressure washing
  - Detergent
    - Type needed varies by situation
  - Sanitizer
    - Strength needed varies by situation

TRAIN WORKERS!

Basic Steps to Keep Products Safe

Facilities & Equipment

- Procedure:
  - Rinse
  - Wash
  - Rinse
  - Sanitize

    Example:
    - Food contact surfaces – 200 ppm chlorine
      - 1 tablespoon plain household bleach per gallon of water
    - Surfaces not contacting food – 400 ppm chlorine
      - 2 tablespoons plain household bleach per gallon of water

Basic Steps to Keep Products Safe

Harvest & Storage

- Practice good personal hygiene
- Use clean and sanitized equipment
- Label plots and containers (traceability)
- Wash produce before entering packing facility
- Different containers for field and market
- Clean storage areas


Basic Steps to Keep Products Safe

Harvest & Storage

- Monitor storage temperatures
  - Removing field heat as soon as possible preserves quality and enhances safety
  - Lower temperatures lower the growth rate of most microorganisms
  - Most can be stored at 41F; some susceptible to chill injury

    www.caes.uga.edu/applications/publications/files/pdf/FS%20100_2.PDF

Basic Steps to Keep Products Safe

Transport

- Clean transport equipment and vehicles between uses
- Keep produce cool during storage and transport to maintain quality and enhance safety

What "best practices" do you see in this picture?

Basic Steps to Keep Products Safe

Transport

ANSWER:

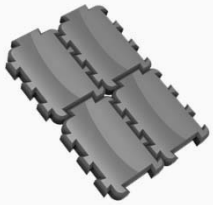
- Lidded container
- Ice for cooling
- Plastic for ease in cleaning & sanitizing

So what does it all mean?

- Any produce, whether organically grown or conventionally grown, whether from your own back yard or thousands of miles away, can be contaminated if it is not handled properly all the way from the farm to the market.

Food Safety Plans On the Farm

Put all the pieces together and you've got a food safety plan.



Enhancing the Safety of Locally Grown Produce – On The Farm Video

Examples of how other farmers have implemented "best practices" to produce safe products

Foods & Nutrition EDUCATION
The University of Georgia Cooperative Extension Service

Keeping Food Safe

Food Storage Times for the Home

Proper storage keeps foods tasting fresh longer. It also slows down the growth of bacteria that makes food spoil or become unsafe to eat. This chart shows the maximum amount of time foods will be fresh and safe to eat. The time foods can be stored depends on:

- ✓ **how fresh the food was at the grocery store.**
- ✓ **the temperature of the refrigerator or freezer.**
- ✓ **how well the food was wrapped or covered.**

Colder temperatures keep foods fresh and safe longer. Freezers that are part of a refrigerator are not as cold as separate freezer units. Therefore, frozen foods last longer when stored in separate freezer units.

Food	Refrigerator (40°F)	Freezer (0-10°F)
Eggs, fresh, in shell	4-5 weeks	Do not freeze
raw yolks, whites	2-4 days	1 year
Hard cooked	1 week	Do not freeze
Liquid pasteurized eggs or egg substitutes, unopened.	10 days	1 year
Mayonnaise, commercial (refrigerate after opening)	2 months	Do not freeze
TV dinners, frozen casseroles	—	3-4 months
Fresh meat (tightly wrapped)		
Ground meat (beef, chicken, turkey, pork, lamb, veal) and stew meats	1-2 days	3-4 months
Steaks, roasts and chops:		
beef	3 days	6-12 months
lamb	3 days	6-9 months
pork or veal	3 days	4-6 months

Food	Refrigerator (40°F)	Freezer (0-10°F)
Fresh poultry (tightly wrapped)		
Whole chicken or turkey	1-2 days	1 year
Chicken or turkey pieces	1-2 days	9 months
Fresh fish, gutted	1-2 days	3-6 months
Hot dogs, unopened package	2 weeks	1-2 months
Lunch meats, unopened package	2 weeks	1-2 months
Bacon (tightly wrapped)	7days	1 month
Sausage, raw from pork, beef or turkey	1-2 days	1-2 months
Smoked breakfast links, patties	7 days	1-2 months
Hard sausage-pepperoni, jerky sticks	2-3 weeks	1-2 months
Corned beef in pouch with pickling juices	5-7 days	1 month (drained and wrapped)
Ham, canned, label says keep refrigerated, unopened	6-9 months	Do not freeze
Ham, fully cooked-whole	7 days	1-2 months
Ham, fully cooked-half or slices	3-5 days	1-2 months
Dairy Products		
Milk-whole, low fat or skim	7 days	3 months
Reconstituted evaporated or opened condensed milk	4-5 days	Do not freeze
Reconstituted dry milk	4-5 days	Do not freeze
Cream	1-2 weeks	2 months
Buttermilk	1-2 weeks	3 months
Butter	1-3 months	6-9 months
Cheese		
Hard	3-4 weeks	6 months
Cottage cheese	1 week	Does not freeze well
Cream cheese	2 weeks	Does not freeze well
Processed cheese	1 month	4-6 months
Sour cream	1-3 weeks	Do not freeze
Yogurt	1-2 weeks	1-2 months
Ice Cream	—	2-3 weeks
Expressed breast milk	1 day	3-4 months
Infant formula	2 days	Do not freeze

Adapted from the University of Nebraska Cooperative Extension bulletin, "Food Storage" and USDA-FSIS, *Cooking for Groups - A Volunteer's Guide to Food Safety*, 2001.

Released by Gail M. Hanula, Extension Nutrition-EFNEP Specialist, and Judy Harrison, Ph.D., Extension Foods Specialist.
February, 2003 • Publication Number: FDNS-NE 601

Foods & Nutrition EDUCATION
The University of Georgia Cooperative Extension Service

Keeping Food Safe

Storing Leftovers Safely

Store leftovers properly to keep them safe. Store leftovers in clean, covered containers. Store a large amount of leftovers in several small shallow containers instead of one large container.

This chart shows the maximum amount of time leftovers should be kept in the refrigerator or freezer. The time leftovers can be kept safely depends on:

- ✓ **whether or not the food was handled safely during preparation.**
- ✓ **how fast the food cooled down to refrigerator or freezer temperature.**
- ✓ **the temperature of the refrigerator or freezer.**

Once leftovers are reheated, they should not be stored again. Throw away any reheated leftovers that are not eaten.

Food	Refrigerator (40°F)	Freezer (0-10°F)
Eggs, liquid pasteurized or egg substitutes, opened	3 days	Do not freeze
Deli and vacuum-packed products: Store-prepared (or homemade) egg, chicken, tuna, ham or macaroni salads	3-5 days	These products do not freeze well
Pre-stuffed pork and lamb chops, chicken breasts stuffed with dressing	1 day	
Cooked meat and meat dishes	3-4 days	2-3 months
Soups and stews, gravy and meat broth	1-2 days	2-3 months

Food	Refrigerator (40°F)	Freezer (0-10°F)
Cooked poultry, poultry dishes	1-2 days	4 months
Chicken nuggets, patties	1-2 days	1-3 months
Cooked fish	3-4 days	4-6 months
Hot dogs, opened package	1 week	1-2 months (wrapped)
Lunch meats, opened package	3-5 days	1-2 months (wrapped)
Baby food		
Strained fruits or vegetables*	1-2 days	6-8 months
Strained meats and egg yolks*	1 day	1-2 months
Meat and vegetable combinations*	1-2 days	3-4 months

* These storage times are for opened jars or homemade baby food. Follow the "use-by" date for shelf storage of unopened jars.

Adapted from the University of Nebraska Cooperative Extension bulletin, "Food Storage"

Released by Gail M. Hanula, Extension Nutrition-EFNEP Specialist, and Judy Harrison, Ph.D., Extension Foods Specialist.
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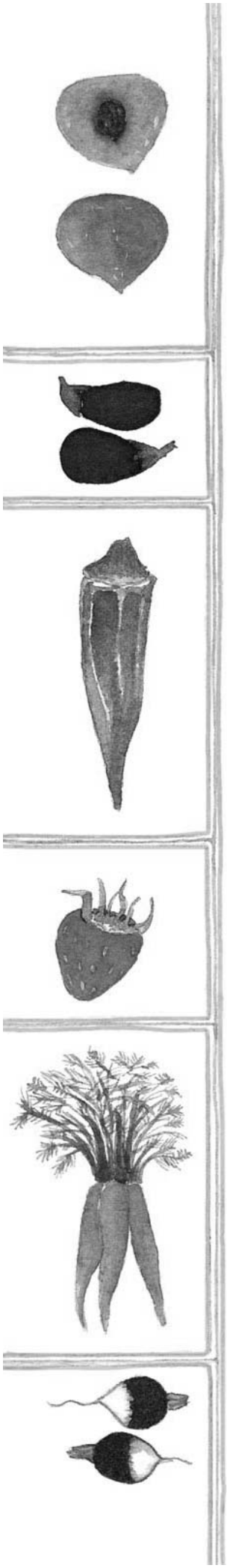

Preserving Food:

What to do *if the* Freezer Stops

Freezer failure can mean the loss of all or part of a large investment in food, time, and money. It pays to know what to do if your equipment stops working. At any time of the year, a freezer may fail to function because of mechanical problems, power failures or human error. The best time to decide how to handle such an emergency is before it happens.

When a freezer does fail to work, the first rule is to **keep the freezer door closed**. In a well-filled freezer, food will probably remain frozen for about two days if the door is kept closed.

What To Do When Your Freezer Stops

When you first notice that your freezer has stopped, **try to determine the cause.** It might be something simple like a blown fuse, a shortage in the electrical circuit or an accidental disconnection. In any of these cases, restore normal operation as quickly as possible and check the food for thawing.

In case of a power failure, **check with the utility company to see how long it will be before power is restored**. If your freezer has failed because of mechanical problems, read the instruction book to see if there is something you can do to get it back into operation. If not, find out how soon the repairman can service your freezer.

What To Do To Keep Your Food From Thawing

If your freezer is not likely to be operating again within a day, you can do one of several things. First, check into moving your frozen food to a freezer that is working. You might have a friend or neighbor with space in his or her freezer for your food or there may be space in a church or school freezer. You might also check into the possibility of moving your freezer's contents to a local freezing plant. To move your food, put it in insulated boxes or between thick layers of newspapers and blankets. Once you have taken the food out of your freezer, get it to an operating freezer as soon as possible.

When your freezer is empty, unplug and defrost it according to the instructions in the owner's manual. After it is defrosted, clean it thoroughly. While your freezer is not in use, leave the door open slightly to let air circulate in the food compartments. As a safety precaution for young children, be sure the door is fixed so it cannot be closed.

If there is no space available in another freezer, use dry ice in your freezer to keep your food frozen. To locate a source of dry ice in your community, check the yellow pages under "Dry Ice" or "Carbonic Gas."

Dry ice is very cold. Handle it quickly and always wear heavy gloves to prevent the ice from burning your hands. When you buy dry ice, have it cut into small enough sizes to use. Do not try to cut or chip it yourself. Ask the dry ice company to wrap each piece in newspaper for you.

A 50-pound cake of dry ice is enough to protect solidly frozen food in a full 20-cubic foot freezer for three to four days. A 25-pound cake should hold the temperature of a half- full, 10-cubic foot freezer below freezing for two to three days.

Put heavy cardboard on top of packages of frozen food in each compartment of your freezer and put the dry ice on top of the cardboard. Close the freezer, but do not lock it. Do not open the freezer again until you need to replace the dry ice or the freezer is working again. You can provide extra insulation for your freezer by covering it with blankets or quilts. Putting packaging material or crumpled newspapers between the cabinet and the blankets will also help. Be sure, however, to fasten coverings away from the air vents on the outside of the freezer. The power may come on unexpectedly and ventilation will be needed. The harmless gas given off by the dry ice also needs to escape.

Dry ice is carbon dioxide in its solid form. It evaporates rather than melts and leaves no liquid. You may notice an off odor caused by carbonic acid, which is formed by the dry ice and moisture in the freezer. It is harmless. Simply leave the freezer door open a few minutes to let it escape.

What To Do With Thawed Food

Some thawed foods can be re-frozen. However, the texture will not be as good. Other foods may need to be discarded. Here are some guidelines:

Meat and Poultry: Re-freeze if the freezer temperature stays 40°F or below and if color and odor are good. Check each package, and discard any if signs of spoilage such as an off color or off odor are present. Discard any packages that are above 40°F (or at room temperature).

Vegetables: Re-freeze only if ice crystals are still present or if the freezer temperature is 40°F or below. Discard any packages that show signs of spoilage or that have reached room temperature.

Fruits: Re-freeze if they show no signs of spoilage. Thawed fruits may be used in cooking or making jellies, jams, or preserves. Fruits survive thawing with the least damage to quality.

Shellfish and Cooked Foods: Re-freeze only if ice crystals are still present or the freezer is 40°F or below. If the temperature is above 40° F, throw these foods out.

Ice Cream: If partially thawed, throw it out. The texture of ice cream is not acceptable after thawing. If its temperature rises above 40°F, it could be unsafe.

Creamed Foods, Puddings and Cream Pies: Re-freeze only if freezer temperature is 40°F or below. Discard if the temperature is above 40°F.

Breads, Nuts, Doughnuts, Cookies and Cakes: These foods re-freeze better than most. They can be safely re-frozen if they show no signs of mold growth.

What To Do To Plan Ahead

To be prepared in case your freezer stops, plan ahead. Find out where the nearest commercial or institutional freezers are. Locate a source of dry ice.

During the seasons when power failures are frequent or if you know the power will be off, it is good insurance to run the freezer between -10°F and -20°F. The colder the food, the more slowly it thaws.

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Edited by Judy A. Harrison, Ph.D., Extension Foods Specialist and Elizabeth L. Andress, Ph.D., Extension Food Safety Specialist.

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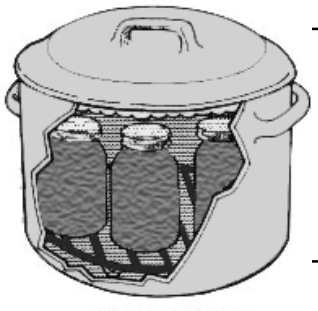

Preserving Food:
Using Boiling Water Canners

Most boiling water canners are made of aluminum or porcelain-covered steel; at least one stainless steel model is also available. Boiling water canners have fitted lids and removable racks that are either perforated or shaped wire racks. The canner must be deep enough so that at least one inch of briskly boiling water will be over the tops of jars during processing. Some boiling water canners do not have completely flat bottoms; these will not work well on smooth top ranges. The canner bottom should also be fairly flat for use on electric burners. Either a flat or ridged bottom may be used on a gas burner. To ensure uniform processing of all jars with 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.) Before canning on a smooth top range, check the range manufacturer's advice on suitability for canning and recommended maximum canner size for specific burners.

Follow these steps for successful boiling water canning:

(Read through all the instructions before beginning.)

1. Before you start preparing your food, place canner rack in the bottom of a boiling water canner. Fill the canner half full with clean warm water for a canner load of pint jars. For other sizes and numbers of jars, you will need to adjust the amount of water so it will be 1 to 2 inches over the top of the filled jars.

2. Center the canner over the burner and preheat the water to 140 degrees F. for raw-packed foods and to 180 degrees F. for hot-packed foods. You can begin preparing food for your jars while this water is preheating.

3. Load filled jars, fitted with lids and ring bands, into the canner one at a time, using a jar lifter. When moving jars with a jar lifter, make sure the jar lifter is securely positioned below the neck of the jar (below the ring band of the lid). Keep the jar upright at all times. Tilting the jar could cause food to spill into the sealing area of the lid.

   If you have a shaped wire rack that has handles to hold it on the canner sides, above the water in the canner, you can load jars onto the rack in the raised position and then use the handles to lower the rack with jars into the water.

4. Add more boiling water, if needed, so the water level is at least one inch above the jar tops. Pour the water around the jars and not directly onto them. For process times over 30 minutes, the water level should be 2 inches above the jars.

- continued -

5. Turn the heat setting to its highest position, cover the canner with its lid and heat until the water boils vigorously.

6. Set a timer (after the water is boiling) for the total minutes required for processing the food.

7. Keep the canner covered for the process time. The heat setting may be lowered as long as a gentle but complete boil is maintained for the entire process time.

8. Add more *boiling* water during the process, if needed, to keep the water level above the jar tops. Pour the water around the jars and not directly onto them.

9. If the water stops boiling at any time during the process, turn the heat on its highest setting, bring the water back to a vigorous boil, and begin the timing of the process over, from the beginning (using the total original process time).

10. When the jars have been processed in boiling water for the recommended time, turn off the heat and remove the canner lid. Wait 5 minutes before removing jars to allow the canner contents to settle. This waiting period is not required for safety of the food when using USDA or University of Georgia processing times, however.

11. Using a jar lifter, remove the jars one at a time, being careful not to tilt the jars. Carefully place them directly onto a towel or cake cooling rack, leaving at least one inch of space between the jars during cooling. Avoid placing the jars on a cold surface or in a cold draft.

12. Let the jars sit undisturbed while they cool, from 12 to 24 hours. Do *not* tighten ring bands on the lids or push down on the center of the flat metal lid until the jar is completely cooled.

13. Remove ring bands from sealed jars. Put any unsealed jars in the refrigerator and use first.

14. Wash jars and lids to remove all residues.

15. Label jars and store in a cool, dry place out of direct light.

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Preserving Food:
Using Pressure Canners

Pressure canners for use in the home were extensively redesigned beginning in the 1970's. Models made before the 1970's were heavy-walled kettles with clamp-on or turn-on lids. They were fitted with a dial gauge, a vent pipe in the form of a petcock or covered with a counterweight, and a safety fuse. Most modern pressure canners are lightweight, thin-walled kettles; most have turn-on lids fitted with gaskets. At least one style is still made with heavy cast aluminum, has screw-down knobs around the canner and does not have a gasket, however.

Modern pressure canners have removable racks, an automatic vent/cover lock, a vent pipe (steam vent), and a safety fuse. Use only canners that have the Underwriter's Laboratory (UL) approval to ensure their safety.

Today's pressure canner may have a *dial gauge* for indicating the pressure *or a weighted gauge*, for indicating and regulating the pressure. *Weighted gauges* are usually designed to "jiggle" several times a minute or to keep rocking gently when they are maintaining the correct pressure. Read your manufacturer's directions to know how a particular weighted gauge should rock or jiggle to indicate that the proper pressure is reached and then maintained during processing. *Dial gauge* canners will usually have a counterweight or pressure regulator for sealing off the open vent pipe to pressurize the canner. This weight should not be confused with a weighted gauge and will not jiggle or rock as described for a weighted gauge canner. Pressure readings on a dial gauge canner are only registered on the dial and only the dial should be used as an indication of the pressure in the canner. One manufacturer now makes a dual-gauge canner; read the manufacturer's user manual for information on when and how to use either the weighted gauge or the dial.

Pressure canners come deep enough for one layer of quart or smaller size jars, or deep enough for two layers of pint or smaller size jars. The USDA recommends that a canner be large enough to hold at least 4 quart jars to be considered a pressure canner for the USDA published processes.

Serious errors in processes obtained in pressure canners can occur if any of the following conditions exist:

- The altitude at which the canner is operated is above sea level and adjustments in pressure are not made. Internal canner pressures (and therefore temperatures) are lower at higher altitudes. Canners must be operated at increased pressures as the altitude increases. Check reliable canning instructions for altitude adjustments.

- Air is trapped in the closed canner during the process. Air trapped in a pressure canner lowers the temperature obtained for a given pressure (for example, 10 or 15 pounds pressure) and results in underprocessing. To be safe, USDA recommends that all pressure canners must be vented 10 minutes before they are pressurized.

To vent a canner, leave the vent pipe (steam vent) uncovered (or manually open the petcock on some older models) after you fill the canner and lock the canner lid in place. Heat the canner on high until the water boils and generates steam that can be seen escaping through the open vent pipe or petcock. When a visible funnel-shape of steam is continuously escaping the canner, set a timer for 10 minutes. After 10 minutes of continuous steam, you can close the petcock or place the counterweight or weighted gauge over the vent pipe to begin pressurizing the canner. (See steps 3 and 4 below.)

- An inaccurate dial gauge is used. Dial gauges should be checked for accuracy each year before use. If the gauge reads high or low by more than two pounds at 5, 10 or 15 pounds pressure, replace it. If it is less than two pounds off in accuracy, you can make adjustments needed to be sure you have the required pressure in your canner.

Follow these steps for successful pressure canning:

(Read through all the instructions before beginning.)

1. Make sure the pressure canner is working properly before preparing food. Clean lid gaskets and other parts according to the manufacturer's directions; make sure all vent pipes are clear and contain no trapped material or mineral deposits. Center the canner over the burner. The burner and range must be level. Your pressure canner can be damaged if the burner puts out too much heat. In general, do not use on an outdoor LP gas burner or gas range burner over 12,000 BTU's. Check your manufacturer's directions for more information about appropriate burners.

   Put the rack and hot water into the canner. If the amount of water is not specified with a given food, use enough water so it is 2 to 3 inches high in the canner. Longer processes required more water. Some specific products (for example, smoked fish) require that you start with even more water in the canner. Always follow the directions with USDA processes for specific foods if they require more water be added to the canner.

   For hot packed foods, you can bring the water to 180 degrees F. ahead of time, but be careful not to boil the water or heat it long enough for the depth to decrease. For raw packed foods, the water should only be brought to 140 degrees F.

2. Place filled jars, fitted with lids and ring bands, on the jar rack in the canner, using a jar lifter. When moving jars with a jar lifter, make sure the jar lifter is securely positioned below the neck of the jar (below the ring band of the lid). Keep the jar upright at all times. Tilting the jar could cause food to spill into the sealing area of the lid.

3. Fasten the canner lid securely. Leave the weight off the vent pipe or open the petcock.

4. Turn the heat setting to its highest position. Heat until the water boils and steam flows freely in a funnel-shape from the open vent pipe or petcock. While maintaining the high heat setting, let the steam flow (exhaust) continuously for 10 minutes.

5. After this venting, or exhausting, of the canner, place the counterweight or weighted gauge on the vent pipe, or close the petcock. The canner will pressurize during the next 3 to 10 minutes.

6. Start timing the process when the pressure reading on the dial gauge indicates that the recommended pressure has been reached, or, for canners without dial gauges, when the weighted gauge begins to jiggle or rock as the manufacturer describes.

7. Regulate the heat under the canner to maintain a steady pressure at, or slightly above, the correct gauge pressure. One type of weighted gauge should jiggle a certain number of times per minute, while another type should rock slowly throughout the process – check the manufacturer's directions.

    - Loss of pressure at any time can result in underprocessing, or unsafe food.
    - Quick and large pressure variations during processing may cause unnecessary liquid losses from jars.

    IMPORTANT: If at any time pressure goes below the recommended amount, bring the canner back to pressure and begin the timing of the process over, from the beginning (using the total original process time). This is important for the safety of the food.

8. When the timed process is completed, turn off the heat, remove the canner from the heat (electric burner) if possible, and let the canner cool down naturally. (Lift the canner to move it; do not slide the canner. It is also okay to leave the canner in place after you have turned off the burner. It is better to do so than to let jars inside the canner tilt or tip over if the canner is too heavy to move easily.)

    While the canner is cooling, it is also de-pressurizing. Do not force cool the canner. Forced cooling may result in food spoilage. Cooling the canner with cold running water or opening the vent pipe before the canner is fully depressurized are types of forced cooling. They will also cause loss of liquid from jars and seal failures. Forced cooling may also warp the canner lid.

    Even after a dial gauge canner has cooled until the dial reads zero pounds pressure, be cautious in removing the weight from the vent pipe. Tilt the weight slightly to make sure no steam escapes before pulling it all the way off. Newer canners will also have a cover lock in the lid or handle that must release after cooling before the lids are twisted off. Do not force the lid open if the cover locks are not released. Manufacturers will provide more detailed instructions for particular models.

    Depressurization of older canner models without dial gauges should be timed. Standard size heavy-walled canners require about 30 minutes when loaded with pints and 45 minutes when loaded with quarts. Newer thin-walled canners cool more rapidly and are equipped with vent locks that are designed to open when the pressure is gone. These canners are depressurized when the piston in the vent lock drops to a normal position. Some of these locks are hidden in handles and cannot be seen; however, the lid will not turn open until the lock is released.

9. After the canner is completely depressurized, remove the weight from the vent pipe or open the petcock. Wait 10 minutes; then unfasten the lid and remove it carefully. Lift the lid with the underside away from you so that the steam coming out of the canner does not burn your face.

10. Using a jar lifter, remove the jars one at a time, being careful not to tilt the jars. Carefully place them directly onto a towel or cake cooling rack, leaving at least one inch of space between the jars during cooling. Avoid placing the jars on a cold surface or in a cold draft.

11. Let the jars sit undisturbed while they cool, from 12 to 24 hours. Do *not* tighten ring bands on the lids or push down on the center of the flat metal lid until the jar is completely cooled.

12. Remove ring bands from sealed jars. Ring bands can be washed and dried and put away for using another time. Put any unsealed jars in the refrigerator and use first.

13. Wash jars and lids to remove all residues.

14. Label jars and store in a cool, dry place out of direct light.

15. Dry the canner, lid and gasket. Take off removable petcocks and safety valves; wash and dry thoroughly. Follow maintenance and storage instructions that come from your canner manufacturer.

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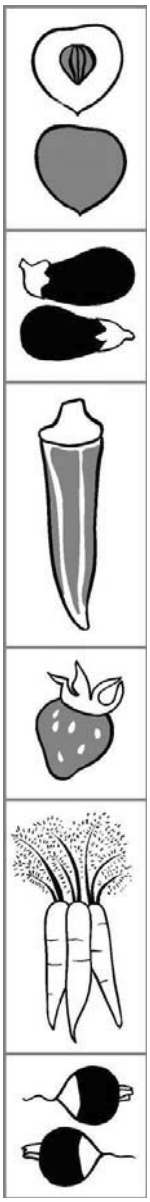

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