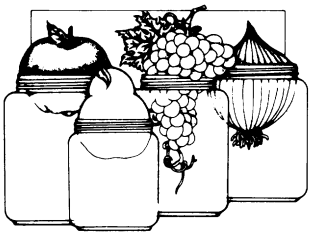
UNIVERSITY OF MISSOURI
MU Extension

NUTRITION AND HEALTH

Before You Start to Can, Learn the Basics

Canning preserves food by using heat to destroy the microorganisms that cause spoilage. Heat forces air out of the jar. As the jar cools, a seal (vacuum) forms. The processing times and temperatures in University of Missouri Extension publications have been set through scientific research. For safe, high-quality home-canned food, it's important that you follow these directions carefully.

Quality for Keeps



How canning preserves foods

Fresh foods spoil for a variety of reasons. Bacteria, molds and yeasts cause damage and so do food enzymes and contact with the air. Microorganisms live and multiply quickly on the surfaces of fresh food and inside bruised, insect-damaged and diseased food. Proper canning techniques will stop the growth and activity of microorganisms and can prevent spoilage and quality loss. Use these techniques to get safe food and high-quality results:

- Carefully select and wash fresh food.
- Prepare foods according to MU Extension recommendations — you may need to peel some fresh foods, add acids (lemon juice, citric acid or vinegar), or use hot packs. See MU Extension publications listed on page 4 for specific instructions.
- Use acceptable jars and self-sealing lids.
- Process jars in a boiling-water bath or pressure canner for the correct period of time.

Only use tested recipes from Cooperative Extension, the U.S. Department of Agriculture (USDA) or Ball Blue Book (dated 1989 or later). Follow canning procedures from the same sources dated 2009 or later.

For safety's sake

Pressure canning is the only canning method recommended for low-acid foods like meat, poultry, seafood and vegetables. Clostridium botulinum, the bacterium that causes botulism food poisoning, is destroyed in low-acid foods when they are processed at the correct time and temperature in pressure canners. Canning low-acid foods in boiling-water canners is absolutely unsafe because the botulinum bacteria can survive this process. If Clostridium botulinum bacteria survive and grow inside a sealed jar of food, they can produce a deadly toxin. Even a taste of food containing this toxin can be fatal. Before eating canned foods, be sure of the following:

- Food was processed following current recommendations from MU Extension, USDA or Ball Blue Book.
- Food was processed in a pressure canner with a gauge that was checked at the beginning of the canning season. (Many local MU Extension centers can check pressure gauges.)
- Time and pressure were adjusted for altitude.
- Process times and pressures matched the size of jar, style of pack and kind of food being canned.
- Jar lid is firmly sealed and concave (curved inward).
- Nothing has leaked from the jar.
- No liquid spurts out when jar is opened.
- No unnatural or "off" odors can be detected.

Examine foods carefully

Don't taste foods that show any signs of spoilage, and never taste food from a jar with an unsealed lid. Some types of spoilage are easier to detect in jars stored without screw bands. When bacteria and yeast grow, they produce a gas that swells lids and breaks jar seals. Examine lids for tightness and vacuum. Lids with concave (curved inward) centers have good seals.

Next, hold the jar at eye level. While rotating the jar, look for streaks of dried food that have dripped down the exterior. Also, check for rising air bubbles and unnatural color in the food.

While opening the jar, try to smell unnatural odors, but do not actually sniff the jar contents. Look for spurting liquid and cottonlike mold growth (white, blue, black or green) on the food surface and underside of lid.

Revised by
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Acidity affects processing methods

Whether you should process food in a pressure canner or boiling-water canner to control botulinum bacteria depends on the amount of acid in the food. The term "pH" is a measure of acidity. The lower the pH, the more acid the food.

Acid foods include pickles, most fruits, and jams and jellies made from fruit. (In pickling, the acid level is increased by adding lemon juice, citric acid or vinegar.) Acid foods contain enough acidity either to stop the growth of botulinum bacteria or to destroy the bacteria more rapidly when heated.

Low-acid foods don't contain enough acid to prevent the growth of botulinum bacteria. Process these foods at temperatures of 240 to 250 degrees F. To reach these high temperatures, you must use a pressure canner operated at 10 to 15 pounds per square inch (psi) of pressure. The exact time depends on the kind of food being canned, the way it is packed into jars, and the size of the jars.

Low-acid foods include red meats, seafood, poultry, milk, all fresh vegetables and some tomatoes. When you mix low-acid and acid foods, assume that the mixture remains low-acid.

Although tomatoes used to be considered an acid food, some are now known to have pH values slightly above 4.6, which means they are low-acid. To safely can them as acid foods in a boiling-water canner, you must add lemon juice or citric acid.

Adjust for altitude to ensure safety

It's important that you know your altitude — even in Missouri. Don't use process times recommended for canning food at sea level if you live at altitudes above

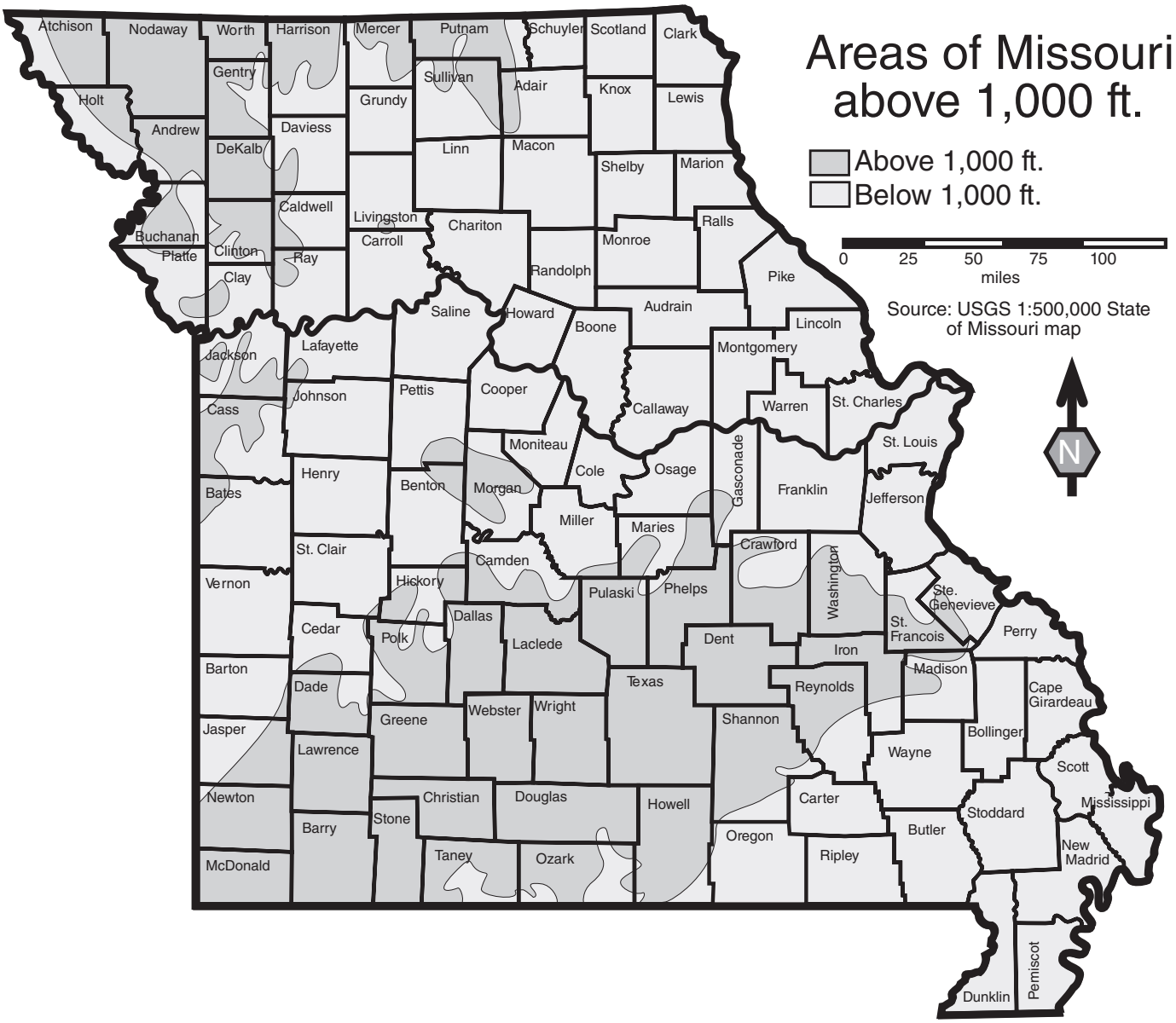

Figure 1. A map depicting the altitudes in Missouri relative to 1,000 feet above sea level.

1,000 feet (Figure 1). Water boils at lower temperatures as altitude increases. Lower boiling temperatures are less effective for killing bacteria. You must increase either the process time or canner pressure to make up for lower boiling temperatures.

Handling suspected spoilage

Do not taste or use food from a jar with an unsealed lid or food that shows signs of spoilage. You can more easily detect some types of spoilage in jars stored without screw bands. Look closely at all jars before opening them. A bulging lid or leaking jars may be signs of spoilage. When you open the jar, look for other signs, such as spurting liquid, an off odor or mold.

Improperly canned low-acid foods can contain the toxin that causes botulism without showing signs of spoilage. Low-acid and tomato foods not canned according to USDA-endorsed recommendations present a risk of botulism. Even if you followed the directions provided herein, if you think it is possible that any deviation occurred, low-acid and tomato foods should be boiled hard in a saucepan before being eaten — even if you detect no signs of spoilage.

At altitudes lower than 1,000 feet above sea level, boil suspect foods for 10 minutes (Figure 1). Add an additional minute of boiling time for each additional 1,000 feet above sea level. Note that these guidelines do not apply to foods known to be significantly underprocessed according to current standards and recommended methods. Not all possible defects and hazards associated with nonrecommended methods can be overcome by this boiling process.

Spoiled canned foods should be discarded in a place where they will not be eaten by humans or pets. Spoiled jars of low-acid vegetables, meats and seafood with unsealed lids should be detoxified to destroy any poisons that might be present before being discarded. If the suspect glass jars or swollen metal cans are still sealed, place them in a heavy garbage bag. Close the bag and place it in a regular trash container or dispose of it in a nearby landfill.

When detoxifying canned low-acid foods that have spoiled, and are unsealed, open or leaking, be extremely careful not to splash or come in contact with the suspect food or liquid. Contact with botulinum toxin can be fatal whether it is ingested or enters through the skin. Wear disposable rubber or heavy-duty plastic gloves. Carefully place the suspect containers and lids on their sides in an 8-quart volume or larger stock pot, pan or boiling water canner. Wash your still-gloved hands thoroughly. Carefully add water to the pot and avoid splashing the water. The water level should be at least 1 inch above the containers. Place a lid on the pot, and heat the water to boiling. Boil 30 minutes to ensure containers and the food therein are detoxified. Cool and discard the containers, their lids and food in the trash, or dispose of them in a nearby landfill.

Improperly canned low-acid foods can contain the toxin that causes botulism without showing signs of spoilage. They should also be discarded or detoxified and discarded as previously explained. Low-acid foods are considered improperly canned if any of the following are true:

- The food was not processed in a pressure canner.
- The gauge of the canner was inaccurate.
- The processing times and pressures used for the size of the jar, style of pack and kind of food were not in line with the most up-to-date recommendations.
- Ingredients were added that were not in an approved recipe.
- Proportions of ingredients were changed from the approved recipe.
- The processing time and pressure were not correct for the altitude at which the food was canned.

Surfaces that come in contact with spoiled or questionable food should also be cleaned up, again taking care to avoid contact with suspect foods or liquids. Wear rubber or heavy-duty plastic gloves when cleaning up contaminated work surfaces and equipment. A fresh solution of one part unscented liquid household bleach (5 to 6 percent sodium hypochlorite) to five parts clean water should be used to treat work surfaces, equipment or other items, including can openers and clothing, that might have come in contact with suspect foods or liquids. Spray or wet contaminated surfaces with the bleach solution, and let stand for 30 minutes. Wearing gloves, wipe up treated spills with paper towels while taking care to minimize the spread of contamination. Dispose of these paper towels by placing them in a plastic bag before putting them in the trash. Next, apply the bleach solution to all surfaces and equipment again, and let stand for 30 minutes before rinsing. Lastly, thoroughly was all detoxified counters, containers, equipment and clothing. Discard gloves when you have finished cleaning, and wash your hands thoroughly.

Note that bleach is an irritant itself and should not be inhaled or allowed to come in contact with the skin.

Stay clear of unsafe canning equipment and methods

Never open-kettle can or process jars of food in conventional ovens, microwave ovens or dishwashers. These practices do not prevent spoilage.

Steam canners are not recommended because safe processing times have not been adequately researched. Using boiling-water canner processing times with steam canners may result in spoilage. So-called “canning powders” are useless as preservatives and do not replace the need for proper heat processing.

Jars with wire bails and glass caps make attractive storage containers for dry foods, but don’t use them for canning. One-piece zinc, porcelain-lined caps are also no longer recommended.

References

White, Athalie, Ann Ford, Elizabeth L. Andress, and Judy A. Harrison. 2014. *So Easy To Preserve*, 6th ed. University of Georgia Cooperative Extension Service.

This material was adapted from the Complete Guide to Home Canning, United States Department of Agriculture, Agriculture Information Bulletin No. 539.

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