W1400

Canning Homemade Food Items Under the Tennessee Food Freedom Act (TFFA): Water Bath or Pressure Canning?

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Disclaimer:

This publication is for educational purposes only and does not constitute legal advice nor is it intended to be a substitute for the services of a competent legal professional or regulatory oversight.

Section 1. Introduction

Always follow tested recipes from reliable sources such as the USDA Complete Guide to Home Canning, The All New Ball Book of Canning and Preserving, or the National Center for Home Food Preservation.

Canning is a method of preserving food by heating it to destroy microorganisms that may cause spoilage or foodborne illnesses. Canned foods can be found not only in metal cans but also in hermetically sealed jars, bottles, trays and pouches. Hot-fill-hold processing, water bath and pressure canning are three common thermal processing methods for canning foods. The appropriate canning method depends primarily on the acidity of the food. Hot-fill-hold is a thermal process used for certain high-acid or acidified liquid foods where the product is heated to a high temperature, filled into containers while still hot, sealed, inverted and then held for a set time before cooling. For these types of foods, hot-fill-hold bypasses the need for water bath processing or pressure canning. The processing time and temperature for the hot-fill-hold process depend on product acidity as well as processing and packaging parameters. Since their determination may require expert evaluation, hot-fill-hold processing is not recommended for homemade food items under the Tennessee Food Freedom Act (TFFA). Instead, the tested recipes from reliable sources such as the USDA Complete Guide to Home Canning, The All New Ball Book of Canning and Preserving, or the National Center for Home Food Preservation are recommended for the TFFA homemade food items.

This publication provides an overview of the primary health concerns associated with improperly processed canned foods. It also outlines whether water bath or pressure canning should be selected for homemade food items, based on pH, when produced under the TFFA to ensure that these products are processed in a way that minimizes the risk of foodborne illness.

Low-acid foods have a pH greater than 4.6.

Acid and acidified foods have a pH of 4.6 or below.

Section 2. Definitions

Acid and acidified foods: Acid foods are foods that have a natural pH of 4.6 or below. Acidified foods are low-acid foods to which acid(s) or acid food(s) are added to lower the equilibrium pH to 4.6 or below. Acidified foods have water activity greater than 0.85. Both acid and acidified foods have pH of 4.6 or below and can be safely processed at boiling temperatures by water bath canning or hot-fill-hold process.

Homemade food item: Homemade food item means a food, including a non-alcoholic beverage, which is produced and if applicable, packaged at the private residence of the producer. Currently, this is interpreted as having less than 0.5 percent alcohol in the final product. Other restrictions on the types of homemade foods allowed to be sold in Tennessee under the TFFA can be found in UT Extension publication PB1909: Tennessee's Food Freedom Act – 2025 Non-TCS vs TCS Homemade Food Items.

Low-acid foods: Low-acid foods are foods that have pH values greater than 4.6 and water activity greater than 0.85. They require higher temperatures than boiling to control spore-forming bacteria. The higher temperatures can only be achieved by pressure canning.

pH and acidity: pH is a measure of the degree of acidity or alkalinity of a food or solution. Values between 0 and 7 indicate acidity and values between 7 and 14 indicate alkalinity. The value for pure distilled water is 7, which is considered neutral. Products with a pH > 4.6 (commonly referred to as low acid foods) are the most susceptible to pathogenic microorganism growth and spoilage. More acidic foods, pH < 4.6, are less likely to cause foodborne illness because they inhibit the growth of many pathogenic microorganisms. It is essential to measure the pH of the final food product to determine the correct canning method. Details on the pH measurement and pH meter selection can be found in UT Extension publication W1362: Measuring pH of Food Products.

The Food Science Extension Team can measure/verify pH of your final product and provide assistance with best practices for processing canned foods for sale under the TFFA. For more information:
https://foodscience.tennessee.edu/food-science-extension/

Spoilage: Food spoilage is the process by which food quality deteriorates due to the growth of microorganisms and/or chemical changes within the food. These changes can affect the smell, taste and texture of the food. Temperature, oxygen and moisture play key roles in the rate of spoilage.

Section 3. Botulism

Botulism is a major safety concern associated with improperly canned foods. It is a serious foodborne illness caused by a toxin produced by the bacterium *Clostridium botulinum* (*C. botulinum*). This bacterium can exist in two forms: a spore and a vegetative cell. Its spores are dormant and highly heat-resistant. Spores can survive boiling temperatures for up to 10 hours and remain inactive in the environment indefinitely. Spores themselves are not harmful, but they can become dangerous if they germinate into vegetative cells and produce toxins under the right conditions.

The vegetative cell form is the active, growing stage of the bacteria. Vegetative cells multiply and can produce botulinum toxins. Improperly processed canned foods provide ideal conditions for spores to germinate into vegetative cells and produce toxins.

Controlling *C. botulinum* involves managing the conditions that allow it to grow. For low-acid foods (pH > 4.6), proper pressure canning is the only safe method because the high temperatures achieved in a pressure canner (240–250 F) are needed to destroy spores. Maintaining this level of heat for sufficient time destroys the *C. botulinum* spores and prevents toxin formation in low-acid foods. Both acid and acidified foods (pH ≤ 4.6) can be safely processed in a boiling-water canner because the acidity prevents spores from growing even if they survive the heat.

In summary, *C. botulinum* spores survive normal cooking or boiling temperatures but cannot cause illness unless they germinate into vegetative cells after processing. The vegetative cell form is less heat-resistant but produces dangerous toxins.

Section 4. Water Bath Canning

Water bath canning, also known as boiling water canning, relies on boiling water to heat the contents of food containers (typically jars) for preservation. It is ideal for acid and acidified foods (pH ≤ 4.6) that naturally inhibit the growth of *C. botulinum* spores due to the high acidity level. It cannot kill *C. botulinum* spores and is not safe for low-acid foods (pH > 4.6). This method requires a large pot (often called a boiling water canner) with a rack that is used to secure the food containers. It is a beginner-friendly technique commonly used for most fruits, pickles and jams. In water bath canning the jars filled with acid or acidified foods are fully submerged and held at the boiling temperature (212 F at sea level) for a specific time to allow the heat to reach the coldest spot inside the container and kill microorganisms which may be present.

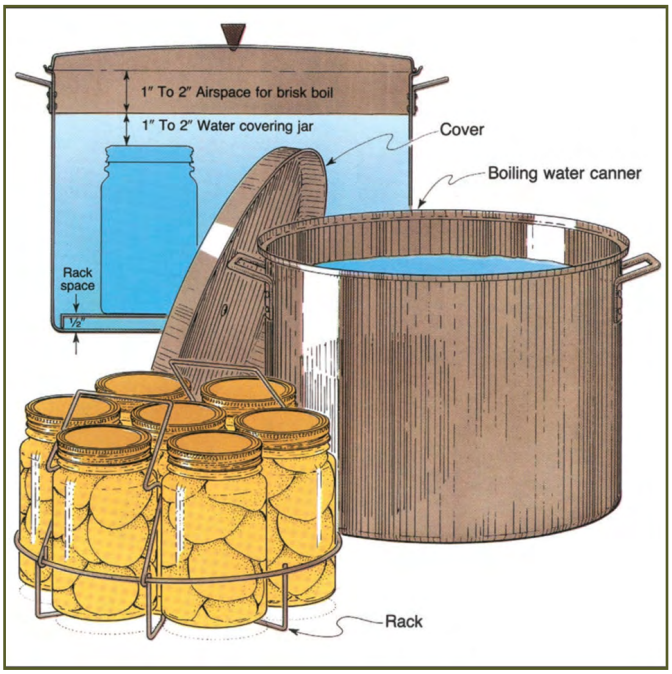
The temperature at which water boils decreases as altitude/elevation increases. Since lower boiling temperatures are less effective for killing bacteria higher altitude locations require longer processing times than those at sea level. The USDA Complete Guide to Home Canning provides the processing times for various elevations in the recipes. The All New Ball Book of Canning and Preserving also includes altitude adjustment charts for water bath canning processes.

Low-acid foods (pH > 4.6) must be pressure canned to reach temperatures above boiling temperatures to eliminate botulism risk.

Section 5. Pressure Canning

Low-acid foods (pH > 4.6) such as vegetables, meats and fish are higher risk products because viable *C. botulinum* spores can germinate and produce toxin when the pH is above 4.6. For preserving low-acid foods, pressure canning is the only safe method because it reaches temperatures above boiling (240-250 F) that can kill *C. botulinum* spores. Although it requires more specialized equipment (a pressure canner) than water bath canning, pressure canning is necessary to safely preserve vegetables, meats and other low-acid products such as soups.

Boiling water canner



Pressure canner

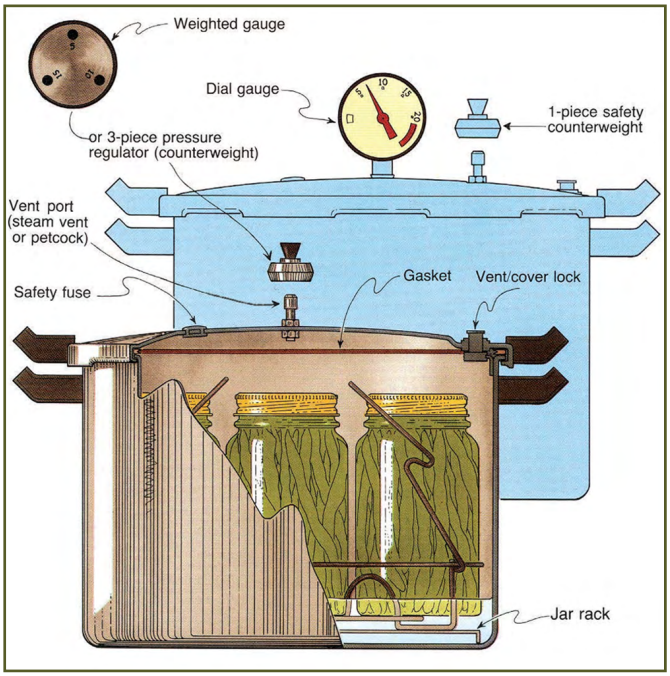


Figure 1 and 2: *Images taken from: USDA Complete Guide to Home Canning*

Section 6. Summary

The decision between water bath and pressure canning mainly depends on the acidity of the food. High-acid and acidified foods (pH ≤ 4.6) can be safely preserved using either a water bath or a pressure canner while low-acid foods (pH > 4.6) must be pressure-canned to prevent the risk of botulism.

Section 7. Our Services

We can measure/verify pH of your final product and provide assistance with best practices for processing canned foods for sale under the TFFA. More information can be found at: foodscience.tennessee.edu/food-science-extension/

Section 8. Additional information

For further information, please contact:

University of Tennessee
Food Science Department
2510 River Drive, Knoxville, TN, 37996
Email: foodsci_ext@utk.edu
Website: foodscience.tennessee.edu/food-science-extension/

Section 9. References and Resources

National Center for Home Food Preservation: nchfp.uga.edu/resources/category/usda-guide

United States Department of Agriculture (USDA). (2015). Complete Guide to Home Canning. Doublebit Press.

UT Extension publication PB1909 Tennessee's Food Freedom Act – 2025 Non-TCS vs TCS Homemade Food Items: tiny.utk.edu/PB1909

UT Extension publication W1362 Measuring pH of Food Products: tiny.utk.edu/W1362

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