

Home-canning Pressures and Processing Times

by Lynn Paul, Ed.D., R.D., Professor and Extension Food and Nutrition Specialist, Montana State University-Bozeman; and MSU Extension Agents: Bernice Mason, Yellowstone County; and Karen Tyra, Stillwater County

Time charts and instructions to ensure safety of home-canned foods.

Safety is the top priority

The United States Department of Agriculture (USDA) home-preservation guidelines used in this MontGuide are based on extensive research to prevent botulism, a potentially deadly foodborne illness caused by a toxin of the bacteria *Clostridium botulinum*, which produces one of the most deadly poisons. *C. botulinum* can grow and reproduce in improperly processed home-canned foods.

The guidelines presented here will also help prevent foodborne illnesses caused by other bacteria, molds and yeast, and will help prevent food spoilage in your home-processed foods.

Additional Resources

This MontGuide is best suited for intermediate and advanced home food preservers. The following resources provide a wide variety of tested recipes and information, based on USDA recommendations, especially important for the beginning food preserver.

National Center for Home Food Preservation (NCHFP), USDA sponsored Web site is the most current source for publications, video clips, tutorials for the beginning home food preserver, frequently asked questions, and seasonal tips: <http://www.uga.edu/nchfp/>

USDA *Complete Guide to Home Canning*, 2006. Available on NCHFP Web site, above, click on 'publications'

So Easy to Preserve, 5th edition only, MSU Extension does not recommend earlier editions. <http://www.soeasytopreserve.com>

The following publications are available at local stores or online at <http://www.kitchenkrafts.com>: *Ball Blue Book Guide to Preserving*, 2009 edition only; *Ball Complete Book of Home Preserving*, 2006 edition only; *Ball Blue Book of Preserving*, 2006 edition only.

Two Questions of Safety

Before beginning your home-canning, ask yourself:

1. What is my altitude?

In order to decrease your risk of food-related illness and death, you must determine the correct home-canning processing times and pressures for your altitude. While water boils at

212°F at sea level, it boils at a much lower temperature at higher altitudes. Consequently, at higher altitudes home-canned foods must be processed for longer times or at higher pressures.

2. Is the food I am home-canning a high-acid or low-acid food?

The following information will help you determine whether you need to use a pressure canner or boiling water canner.

Low-acid foods include vegetables (except most tomatoes), meats, poultry and fish. Acidity helps protect foods from poison-causing bacteria and food spoilage, and because these foods have little natural acidity, they must be processed at higher temperatures and pressures that can only be achieved by pressure canners.

On the other hand, high acid foods used for canning include fruits (naturally high in acid) and properly acidified tomatoes and properly acidified pickled products can be processed in either a boiling water or pressure canner.

NOTE: In recent years, the recommendations for safely canning tomatoes and salsa have changed. Because tomatoes grown today may have less acidity, they need to be acidified before canning by adding 2 tablespoons of bottled lemon juice or ½ teaspoon of citric acid per quart. When canning salsa, only use recipes based on USDA recommendations. These salsa recipes have been tested to determine a safe level of acidity. Do not use unapproved salsa recipes for canning.

Equipment and Methods Not Recommended

Open-kettle canning and the processing of freshly filled jars in conventional ovens, steam canners, microwave ovens, and dishwashers are not recommended because they will not prevent potential poisoning of the botulism toxin. Jars with wire bails and glass caps, one-piece zinc porcelain-lined caps, pressure sauce pans, and gallon jars are no longer recommended.

Ensuring High-Quality Canned Foods

Use only high-quality foods which are at the proper maturity and are free of mold, diseases and major bruises. Trim small bruised spots from food. Never use overripe foods.

SAFE EQUIPMENT

- Jar lifters
- Canning funnels
- Nonmetallic spatulas
- Canning jars and 2 piece lids
- Magnetic wand to lift jars lids
- Boiling water canner for high acid foods equipped with lid and rack. Pot must be large enough to fully surround and completely immerse jars with 1 inch of water. Water must be able to boil rapidly over jars.
- Pressure canner for low and high acid foods. A pressure canner is a specially made heavy pot with a tightly fitted lid. The lid is fitted with a vent and dial or weighted pressure gauge.

PACKING

Style of pack: Many fresh foods contain 10-30 percent air. Hot-packed foods will remove more air from the foods than raw packing, prevent floating of food, and yield a greater quantity product.

Raw-packing is the practice of filling jars with freshly prepared, but unheated foods. Raw-packing works best for vegetables processed in a pressure canner.

Hot-packing is the practice of heating freshly prepared food to boiling, simmering it 2 to 5 minutes, and promptly filling jars with boiled food. This is the preferred pack style for foods processed in a boiling water canner.

Jar size: Follow directions for packing in either ½ pint, pint or quart jars. (NOTE: Not all foods can be safely processed in quart jars. Therefore, not all foods will designate quart directions.)

Head space: Follow directions for specific foods.

Lids: Follow manufacturer's directions for lids.

PROCESSING

Use a pressure canner for low-acid foods (vegetables, meats, poultry and fish). Follow manufacturer's directions for your pressure canner; directions for use vary among manufacturers.

- Test your dial gauge at least once per year. Weighted gauges do not need testing.
- Canners must be vented for 10 minutes to exhaust air. If canner is not vented, excess air will keep the canner pressure and temperature too low for safe processing.
- Determine pressure and times for altitude.
- Start processing time when weighted gauge begins to rock or dial gauge reaches required pressure for your altitude.

Use a boiling water canner for high-acid foods only (fruits, properly acidified tomatoes, properly acidified pickled products)

- Determine processing times for your altitude.
- Start processing time as soon as water returns to boil and be sure jars are covered with one inch of boiling water and are placed on a ½ inch rack.

COOLING

Pressure canner:

- Remove pressure canner from stove, cool at room temperature until pressure returns to zero. Do not force cool the canner by opening vent, removing weight, or running under cold water. After canner is depressurized, remove the weight or open the vent. Wait 10 minutes, then unfasten the pressure canner lid and remove carefully.

Boiling water canner:

- Turn off heat and remove boiling water canner lid after required processing time. Wait 5 minutes before removing jars.

For both pressure and boiling water canners place jars on rack or cloth so air can circulate. Do not expose to draft or cover with towels. Do not touch or tighten lids until jars have cooled.

SEALING

- Cooled jars should have the center of the lid popped down and not moveable when pressed.
- Jars that have not sealed should be repacked and reprocessed for the original processing pressure and time within 24 hours. If not reprocessed, foods may also be refrigerated or frozen.

CONSUMING

- If you are uncertain about the safety of home-canned foods, follow the advice **“When in doubt, throw it out.”**
- Botulism and other deadly foodborne illness causes are not detected in food by sight, smell and taste. Foods may show no sign of spoilage! If a canned food looks spoiled, foams or even has an “off” odor, dispose of it.

PROCESSING TIMES AND PRESSURES FOR PRESSURE CANNERS

For Select Low-Acid Vegetables, Meats and Poultry

TABLE 1. Minutes to Process.

Vegetables	Pint	Quart
See MT200906HR for processing times for fruits, tomatoes and mixtures		
Asparagus, spears or pieces, raw or hot pack	30	40
Beans or peas, shelled, dried, hot pack only	75	90
Beans, baked (see Beans, dry)		
Beans, dry, with tomato or molasses sauce, hot pack only	75	90
Beans, fresh lima – shelled, raw or hot pack	40	50
Beans, snap and Italian – pieces, raw or hot pack	20	25
Beets, whole, cubed, or sliced, hot pack only	30	35
Carrots, sliced or diced, raw or hot pack	25	30
Corn, cream style, hot pack only	85	NA*
Corn, whole kernel, raw or hot pack	55	85
Mixed vegetables, hot pack only	75	90
Mushrooms, whole or sliced, hot pack (½ pint same as pint) NOTE: Wild mushrooms cannot be canned safely.	45	NA*
Peas, green or english, shelled, raw or hot pack	40	40
Peppers, hot pack only (½ pint same as pint)	35	NA*
Potatoes, sweet, pieces or whole, hot pack only	65	90
Potatoes, white, cubed or whole, hot pack only	35	40
Pumpkin and winter squash, cubed, hot pack only	55	90
Spinach and other greens, hot pack only	70	90
Squash, winter, cubed (see Pumpkin)		
Meats	Pint	Quart
See MT200903HR for more information on canning meat, poultry and fish.		
Chicken or rabbit, cut up, without bones, raw or hot pack	75	90
Chicken or rabbit, cut up, with bones, raw or hot pack	65	75
Ground or chopped meat, hot pack only	75	90
Strips, cubes or chunks of meat, raw or hot pack	75	90
Meat stock (broth), hot pack only	20	25
Fish, raw pack only	100	NA**
Smoked fish	110***	NA*

Processing times in this table are only for foods prepared according to the recommendations found in the Additional Resources listed on page 1.

STEPS

1. Follow directions for hot pack or raw pack.
2. Follow directions for head space. (NOTE: Head space is 1 inch for vegetables and all meats except chicken and rabbit, which is 1½ inches.)
3. Determine processing time.
4. Determine pressure based on altitude for either dial or weighted gauge pressure canner.

a. Dial Gauge Canner:

Altitude	Pressure
0000-2000 feet	11 lbs.
2001-4000 feet	12 lbs.
4001-6000 feet	13 lbs.
6001-8000 feet	14 lbs.

For example, use 13 lbs. of pressure (PSI) when processing in Red Lodge at an altitude of 5562 feet.

b. Weighted Gauge Canner: Use 15 pounds. (Note: 15 pounds required for all altitudes above 1,000 feet.)

*Directions for canning in quart jars are not available.

**Directions for canning in quart jars are not available in this Montguide. See Additional Resources, page 4, *So Easy to Preserve*, 5th edition only, and the USDA *Home Guide to Canning*, 2006 edition only, for more information on canning fish.

***Safely canning smoked fish in pints requires distinctly different directions for filling pressure canner than for pressure canning other foods. See Montguide MT200903HR for directions for filling the pressure canner for processing smoked fish as well as the additional resources listed on page 4.

TABLE 2. Altitudes* of County Seats in Montana

County Seat	Altitude	County Seat	Altitude	County Seat	Altitude	County Seat	Altitude
Anaconda	5239	Cut Bank	3793	Hysham	2618	Ryegate	3775
Baker	2968	Deer Lodge	4609	Jordan	2640	Scobey	2461
Big Timber	4199	Dillon	5118	Kalispell	2984	Shelby	3300
Billings	3153	Ekalaka	3494	Lewistown	3936	Sidney	1967
Boulder	4938	Forsyth	2510	Libby	2198	Stanford	4288
Bozeman	4806	Fort Benton	2698	Livingston	4557	Superior	2813
Broadus	3091	Glasgow	2088	Malta	2275	Terry	2228
Butte	5539	Glendive	2053	Miles City	2362	Thompson Falls	2519
Chester	3162	Great Falls	3398	Missoula	3232	Townsend	3869
Chinook	2411	Hamilton	3625	Phillipsburg	5357	Virginia City	5804
Choteau	3799	Hardin	2903	Plentywood	2068	W. Sulphur Sp.	5091
Circle	2500	Harlowton	4185	Polson	2930	Wibaux	2650
Columbus	3599	Havre	2493	Red Lodge	5562	Winnett	2975
Conrad	3523	Helena	4068	Roundup	3198	Wolf Point	2043

*accessed January 22, 2009, <http://nris.mt.gov/montanafacts/townelev.html>

TABLE 3. Processing Time for Select Fruits, Acid Vegetables and Pickled Products in Boiling Water Canner

Food and Kind of Pack	Size	Minutes to Process, at Altitudes (in feet) of:							
		1000-2000	2001-3000	3001-4000	4001-5000	5001-6000	6001-7000	7001-7999	
FRUITS	Apple butter, hot pack *	½ pint	10	10	10	10	10	15	15
		pint	15	15	15	15	15	20	20
	Apple juice, hot pack *	pint & quart	10	10	10	10	10	15	15
	Apples, hot pack	pint & quart	25	25	30	30	30	35	35
	Applesauce, hot pack	pint	20	20	20	20	20	25	25
		quart	25	25	30	30	30	35	35
	Spiced apple rings, hot pack	½ pint, pint	15	15	15	15	15	20	20
	Spiced crab apples, hot pack	pint	25	25	30	30	30	35	35
	Apricots, halved or sliced	Follow directions for peaches							
	Berries, hot pack	pint & quart	20	20	20	20	20	25	25
		pint	20	20	20	20	20	25	25
	Berries, raw pack	quart	25	25	30	30	30	35	35
		½ pint, pint	15	15	15	15	15	20	20
	Berry or fruit syrup, hot pack	pint	20	20	20	20	20	25	25
		quart	25	25	30	30	30	35	35
	Cherries, hot pack	½ pint, pint	15	15	15	15	15	20	20
		pint	20	20	20	20	20	25	25
	Cherries, raw pack	quart	25	25	30	30	30	35	35
		pint & quart	30	30	35	35	35	40	40
	Fruit puree, hot pack *	pint & quart	20	20	20	20	20	25	25
Grape juice, hot pack *	pint & quart	10	10	10	10	10	15	15	
	pint	25	25	30	30	30	35	35	
Peaches, hot pack	quart	30	30	35	35	35	40	40	
	pint	30	30	35	35	35	40	40	
Peaches, raw pack	quart	35	35	40	40	40	45	45	
	pint	25	25	30	30	30	35	35	
Pears, halved, hot pack	quart	30	30	35	35	35	40	40	
	pint	25	25	30	30	30	35	35	
Plums, halved or whole, raw or hot pack	quart	30	30	35	35	35	40	40	
	pint & quart	20	20	20	20	20	25	25	
Rhubarb, stewed, hot pack	pint & quart	20	20	20	20	20	25	25	
TOMATOES	Tomatoes, raw, pressed in, no added liquid **	pint & quart	90	90	95	95	95	100	100
	Tomato juice, hot pack **	pint	40	40	45	45	45	50	50
		quart	45	45	50	50	50	55	55
PICKLED PRODUCTS	Sauerkraut, hot pack	pint	15	15	15	15	15	20	20
		quart	20	20	20	20	20	25	25
	Sauerkraut, raw pack	pint	25	25	30	30	30	35	35
quart		30	30	35	35	35	40	40	
Sweet Gherkins, raw pack	pint	10	10	10	10	10	15	15	
Dilled green or yellow beans, raw pack	pint	10	10	10	10	10	15	15	
Pickled beets, hot pack	pint & quart	35	35	40	40	40	45	45	
Piccalilli or chow chow, hot pack	½ pint, pint	10	10	10	10	10	15	15	
Corn relish or 3-bean, hot pack	½ pint, pint	20	20	20	20	20	25	25	
	pint	15	15	15	15	15	20	20	
Dill pickles, raw pack	quart	20	20	20	20	20	25	25	
	pint & quart	15	15	15	15	15	20	20	
Bread & butter pickles, hot pack	½ pint, pint	15	15	15	15	15	20	20	
Pickled mixed vegetables, hot pack	pint	10	10	10	10	10	15	15	
	quart	15	15	15	15	15	20	20	

Processing times in this table are only for foods prepared according to the recommendations found in the Additional Resources listed on page 1.

STEPS

1. Determine hot pack or raw pack.
2. Determine headspace. (Note: All foods on this list are ½ inch except for those marked with *.)
3. Determine processing time based on altitude. (Altitude chart on page 3.)

* ¼ inch head space; all others are ½ inch.

** Add 1 tablespoon lemon juice or ¼ teaspoon citric acid per pint. Double amount per quart.

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