



## Preserving Foods At Home – The Basics



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# I have home canned food (blank) times.

- 1. 0
- 2. 1
- 3. 2 or more





**Preserving Food...  
Does not improve its quality**


- Start with top-quality fresh produce
- Select produce at its peak
- Choose varieties suitable for canning

Canned food is only as good as the fresh product you start with. When canning, select high quality, unblemished foods.

Can fruits and vegetables immediately after harvesting or purchasing.

Properly store foods to minimize further deterioration

Remove small diseased areas or bruised spots to avoid rapid growth of harmful microorganisms




### What Preservation Does

- Stops growth of microorganisms
  - Spoilage microorganisms
  - Pathogens
- Inactivates enzymes
  - Change color
  - Affects texture
  - Changes flavor
  - Changes nutrition

The jars are heated to a temperature that destroys microorganisms in the food.

The heat also inactivates enzymes. Enzymes are natural chemicals in the food that can cause changes in color, flavor and texture of the product over time.



During the heat processing, air is driven from the jar. As the jar cools, a vacuum seal is formed. This combination of events preserves the food.



**It is okay to water-bath tomatoes.**

✓ 1. True  
2. False

10



0%	0%
1	2



## Canning Method

The canning method that is approved for a food depends on the type of food.

Foods are divided into two main categories:

- \* acid foods
- \* low acid foods

The canning method that is approved for a food depends on certain characteristics of the food. Foods are divided into two main categories, acid foods and low acid foods, for the purpose of canning. Acid foods are foods that contain enough acid to prevent the growth of the bacteria that cause botulism poisoning. Low acid foods contain very little or no acid.



## Two Approved Methods of Canning Foods At Home

1. Boiling Water Canning
2. Pressure Canning

Approximate growth limits for:		Strong Acid
	1	
Molds	2	<b>High-Acid Foods</b>
Yeasts	3	Lemons Pickles Gooseberries Apricots Plums Apples, Blackberries Sour Cherries Peaches Sauerkraut Pears Tomatoes
	4	Process at 212°F in Boiling-Water Canner
Bacteria	5	Olives Carrots Beets, Turnips Green Beans, Spinach Asparagus Lima Beans
	6	
Neutral	7	Peas Corn
		Process at 240°F in Steam-Pressure Canner
		<b>Low-Acid Foods</b>
	14	Strong Alkali

There are two approved methods for canning foods at home. These are:

- 1) Boiling water canning and
- 2) Pressure canning.

Boiling water canning is used for canning acid foods. At sea level, water boils at 212°F. As altitude increases, water boils at lower temperatures. Since lower temperatures would be less effective in killing bacteria, processing time would have to be increased as altitude increases.

Pressure canning is only safe method for canning low acid canned foods. When canned under pressure, temperatures higher than the boiling point of water can be reached. These higher temperatures like 240°F are necessary to destroy spores of bacteria that cause botulism, a very deadly type of food poisoning, as well as spores of bacteria that cause spoilage.

*[Have both types of canners, jars, lids, bubble freers, jar fillers, lid wands, etc. to show during or after the presentation.]*



It's safe to use the oven to can.

- 1. True
- ✓ 2. False







## Unsafe Canning Methods

- Pressure cookers not for canning
- Steam canners
- Open-kettle canning
- Conventional or microwave ovens
- Dishwashers
- Slow cookers
- Sun
- Aspirin






## Unsafe Canning Methods

- Pressure canners should not exceed 15 psi
- Jars with wire bails and glass caps
- Old antique jars
- One-piece zinc porcelain-lined caps
- Glass and zinc caps with flat rubber rings







## Acid Foods

$\text{pH} \leq 4.6$  (measure of acidity)

- Generally all fruits
- Tomatoes and figs are borderline – (specific amounts of citric acid or lemon juice must be added before canning to acidify)
- Sauerkraut
- Foods to which large amounts of acid are added (pickles)



The term, “pH,” is a measurement of the acid level in a food. pH is measured on a scale from 1 to 14. The closer the pH value is to one, the more acid the food contains. A pH of 7 is neutral. “Acid” foods have a pH less than or equal to 4.6. Acid foods include most all fruits. However, tomatoes, figs and Asian pears are borderline and specific amounts of bottled lemon juice or citric acid must be added to them before canning to ensure safety of the recommended process. Acid foods also include sauerkraut and naturally fermented foods that are preserved by natural acids produced during the fermentation process and foods to which large amounts of acid (usually in the form of vinegar) are added. An example would be pickles.



## Low Acid Foods

pH > 4.6

- Generally all vegetables
- Meats
- Poultry
- Seafood
- Soups
- Mixtures of acid and low acid foods  
(spaghetti sauce – meat, vegetables and tomatoes)



Foods are considered to be low acid foods if they have a pH greater than 4.6. This category includes vegetables, meats, poultry, seafood, soups and other mixtures of both acid and low acid ingredients. An example of such a mixture would be spaghetti sauce with tomatoes, meat and vegetables.



**If it seals, it's safe.**

1. True
2. False

10




0%

0%

1

2

False, it just means it sealed in whatever is in the jar.



**Why Do Low Acid Foods Have to be Pressure Canned to be Safe?**

**Clostridium botulinum!**

- C. botulinum forms protective, heat-resistant spores.
- Spores require higher temperatures for destruction in a reasonable period of time (usually 240°F or above at sea level)

*Clostridium botulinum*, the bacteria that causes botulism is a spore former. When conditions are not favorable for the organism to grow (high heat, dryness, etc.), the bacterial cell forms a protective structure called a spore. To destroy the spore, it takes a higher temperature than boiling. If the spores are not destroyed, they will germinate and produce toxin in the food when it is stored on the shelf.

Microorganism found commonly in soil and produces a deadly toxin or poison.


Vegetative cells – actually produce toxin

Spores – protective structures

Vegetative cells can be killed in a reasonable time at boiling temperatures; spores can withstand boiling temperatures.

Spores in favorable conditions can germinate into vegetative cells. Proper conditions are low acid and absence of air= sealed canning jars.

240 degree F.




## What Can Happen If Low Acid Foods Are Not Pressure Canned?

When conditions become favorable:

40 – 140 degrees F  
High moisture  
No air in jar

→ Spores germinate and form toxin-producing cells

↓

 **Botulism**

When the canned food cools down, here is what you have:

- A temperature that is in the danger zone between 40 and 140°F
- A lot of moisture in the jar.
- No air in the jar...a vacuum seal.

These are the perfect condition for *Clostridium botulism* to flourish.



- \* Food can contain toxin without showing signs.
- \* Symptoms usually appear within 12 to 72 hours:
  - Digestive upset (in some cases)
  - Blurred, double vision
  - Difficulty swallowing, speaking and breathing
  - Death

Food can contain the toxin without any visible signs of spoilage. It causes a very deadly type of food poisoning that begins usually within 72 hours after consuming the contaminated food. Symptoms can include digestive upset, blurred or double vision, difficulty swallowing or breathing, paralysis and eventually death.





## Preventing Botulism

### Home Canned Foods

- Spores won't germinate in acid environments.
- Spores are destroyed when heated long enough at a specific temperature.
- USDA recommends a canner temperature of at least 240°F at sea level for canning low acid foods.
- Pressure canner must be used for all low acid foods.

Botulism can be prevented...IF YOU FOLLOW THE RULES!

The spores will not germinate in acid environments. This is why acid foods or foods that have acid added to them like tomatoes and pickles can be safely canned in a boiling water bath. Spores are destroyed when heated long enough at a specific temperature. For canning low acid foods, USDA recommends a canner temperature of 240°F at sea level. Temperatures this high can only be reached in a pressure canner. Pressure processing is the only safe way to can all low acid foods.



### Important "Musts" for Canning

- Food must be properly prepared and processed the correct amount of time.
- Canner must be accurate and operated correctly.
- You may need to make altitude adjustments, depending on your altitude.
- Directions from a reputable source
- Only up-to-date methods and information should be used; beware of "granny's method."

Besides selecting the appropriate method of canning, there are certain other rules you must follow to have safely canned products.

- 1) If the directions say to peel and chop, then peel and chop. If they say to leave whole, then leave whole. If it says process 30 minutes for pint jars, then put it in pint jars and process not 20, not 25, but how long??? ... 30 minutes.
- 2) If pressure canning in a dial gauge canner, your gauge must be tested and accurate. Whatever type of canner you have, it must be operated correctly.
- 3) You may need to make altitude adjustments, depending on where you live.
- 4) Only use directions from reputable sources such as USDA, Cooperative Extension, the National Center for Home Food Preservation, the *Ball Blue Book* or *So Easy To Preserve*.
- 5) Don't rely on recipes from granny or your friends. Check reputable sources before you begin. Canning recommendations have changed over the years as new research has led to safer methods.



### How Canning Process Times Are Determined

- Foods are prepared by a specific procedure.
- The length of time it takes to adequately heat the coldest spot in the jar is determined.
- Size of the jar, size of the food, consistency of the canning liquid, etc. all have an effect on how heat penetrates through the product.

Canning processes are determined for specific foods prepared by specific directions for a particular size of jar. The process time is determined based on the length of time it takes to adequately heat the coldest spot in the jar. The way the food is prepared (such as the size of pieces, with or without the peel, etc.), the consistency of the canning liquid and the size of the jar have an effect on how heat penetrates through the product.



### What Does This Mean???

- Follow directions exactly. The following slow heat penetration:
  - Adding extra sugar or fat.
  - Having food pieces larger than called for in directions.
  - Adding thickeners.
- Note: Heat-up and cool-down in pressure canners is counted toward heat penetration so don't quick-cool the canner!

That is why it is important to follow directions exactly. If you add extra sugar or fat, or if you do not prepare the food according to the directions, or if you add thickeners like starch, rice or noodles, then the process time tested as being accurate to heat even the cold spot in the jar may not be safe. Also when canning, you cannot rush the process. Heat up and cool down times are a part of the process so don't try to cool the canner down quickly by setting it under cold, running water.

Dangerous – no research to show:

--pH content of jar

--how hot food inside jar was at end of processing

--how long a safe shelf life product has

Recipe Doesn't Call for Processing:

Sign of old recipe

Unsafe with today's knowledge

Process either water bath or pressure canner



University of Georgia - National Center for Home Food Preservation [www.uga.nchfp.org](http://www.uga.nchfp.org)

USDA Complete Guide to Home Canning (1994) [http://www.uga.edu/nchfp/publications/usda/can\\_guide\\_order.html](http://www.uga.edu/nchfp/publications/usda/can_guide_order.html)

K-State Rapid Response Center


Kerr/Ball <http://www.homefoodpreservation.com/>

Books:

Putting Food By

Ball Blue Book of Preserving -2005 (\$8.50)

So Easy to Preserve by Univ. of GA



### Methods of Pack

- **Raw Pack**
  - For foods that lose shape when cooked.
  - Place raw food directly in jars. Boiling hot liquid is then poured over the food.
- **Hot Pack**
  - Preferred method for most foods.
  - Food is cooked in liquid before packing. Cooking liquid poured over food in jar.

The method of packing the jars also plays an important role in heat transfer through the product.

In a raw pack, raw food is placed directly in the jars. Then hot, boiling liquid is poured over the contents. Pack firmly, but do not crush. Free the bubbles or trapped air between the pieces of food. Wipe the jar rims. Add lids, adjust ring bands and process.

Hot pack is preferred method for most foods. Food is cooked in liquid before packing. Cooking liquid poured over food in jar. Then the cooking liquid is poured over the food in the jar. The advantages of this method are that fewer jars are needed, there is less floating of the food because air has cooked out of it, the color and flavor are better retained, and the foods are easier to pack in the jars because they are more pliable.

*[Activity: Have jars of food canned by hot pack method and same food canned using a raw pack. Ask the audience which method they think was used for each jar and why. Raw packs usually have more floating food than hot packs.]*



## Headspace

- Space in the jar between the inside of the lid and the top of the food or its liquid. Check directions for the correct headspace.
- **Too little**
  - Food may bubble out during processing.
  - Deposit on rim may prevent proper sealing.
- **Too much**
  - Food at the top is likely to discolor.
  - Jar may not seal properly, because not all air may be forced from jar during process.

When filling the jars, it is important not to overfill. We call the space at the top of the jar, between the top of the food and the bottom of the lid, the headspace. Check the directions for the correct amount of headspace called for in a recipe.

What happens if you do not leave the correct headspace?

If there is too little, food may bubble out or run over during processing. Then deposits on the rim may keep the jar from sealing properly. If there is too much headspace, the food at the top of the jar is likely to discolor during storage, and the jar may not seal because all of the air was not forced out.

For jelly, it is usually  $\frac{1}{4}$  inch. For acid foods like fruits, tomatoes and pickles, it is  $\frac{1}{2}$  inch. For low acid foods like vegetables, meats and mixtures of acid and low acid foods, it is usually one inch.



## Processing Time

- \* Each food has its own processing time.  
**Follow directions carefully!**
- \* Time differs with size of jar.
- \* Too Little
  - Spoilage

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Remember...

Each food has its own processing time, and that time differs with the size of the jar. So follow the directions carefully for the size of the jar you are using! If you process too little, the food can spoil and in some cases, may be unsafe.





## Canning Equipment

- Jars
- Two-piece vacuum sealing caps
- Small canning utensils
- Appropriate canner



## Water-bath Canner

- Food high in acid
- 212°F
- Base, rack, lid



Tips on using pressure canners and water bath canners can be found on the Rapid Response Center web site at <http://www.rrc.ksu.edu/DesktopDefault.aspx?tabid=28> under “Other Resources.”

Always read manuals before using!

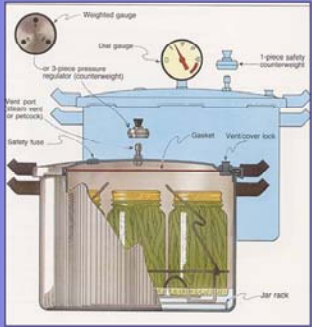

The Ball Blue Book and So Easy to Preserve also give good instructions.

Fruits, pickles, jams and jellies are water bath canned.

Tomatoes and fruits could also be pressure canned. For fruits, see p. 49 of So Easy to Preserve. Tomato recipes give recommendations for both methods.

## Pressure Canner

- Low acid
- 240°F
- Base, rack, lid
- Gauge
  - Dial
  - Weight



All vegetables and meats **MUST** be pressure canned.



# Pressure Gauge Testing

- Dial pressure gauges need yearly testing
- If more than 2 pounds off, replace
- Weighted gauges do not need testing
- 1 pound error in a 20-minute process causes over 10% decrease in sterilizing value
  - 2 pound error a 30% decrease



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## Old pressure canners

- Check condition
- Is it warped?
- Can you get replacement parts?
- Is there an instruction manual?
- May not be a garage sale bargain!





For replacement parts, see the Rapid Response Center web site at <http://www.rrc.ksu.edu/DesktopDefault.aspx?tabid=18> under “Canner Replacement Parts.”



## You can reuse mason canning jars.

- 1. True
- 2. False

10



0%	0%
1	2



## Jars and Lids

- Canning or Mason-type jar
  - Don't use if nicked or scratched
  - Variety of sizes
  - Use plastic knife to remove air bubbles
- 2-piece canning lids and ring bands
  - Wipe jar rims with wet, clean cloth
  - Adjust lids fingertip-tight
  - Never reuse lids
  - Store without ring

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In canning, food is placed in a canning or Mason-type jar, not just any jar. These have been made to specifically stand up to the heat processes (tempered glass) used in canning and can be used over and over without breaking. Variety of sizes – narrow or wide mouth, quart, pint, etc.

The jars are sealed using a 2-piece lid system which consists of a flat lid and a ring band. Never reuse lids. Tighten fingertip-tight.

To prepare jars for canning, follow these steps.

- \* Wash canning jars; don't use if chipped or scratched – keep hot until used.
- \* Prepare 2-piece canning lids and ring bands according to package instructions for the brand you are using.
- \* Remove air bubbles. Use a plastic knife or bubble freer for this so as not to scratch the jars.
- \* Wipe jar rims with wet, clean cloth or paper towel to remove any residue.
- \* Adjust the two-piece lids; tighten until fingertip-tight.



# Tools for Home Canning




- Jar lifter
- Jar funnel
- Plastic spatula
- Lift wand
- Crock
- Pot holders & towels
- Wooden spoon
- Tongs
- Measuring cups & spoons
- Cutting board
- Knives
- Bubble freer



- Wire basket
- Jelly bag
- Colander
- Large sauce pot
- Sauce pan
- Timer
- Food mill
- Spice bag
- Cheese cloth
- Food scale
- Grater, zester, corer
- Vegetable peeler





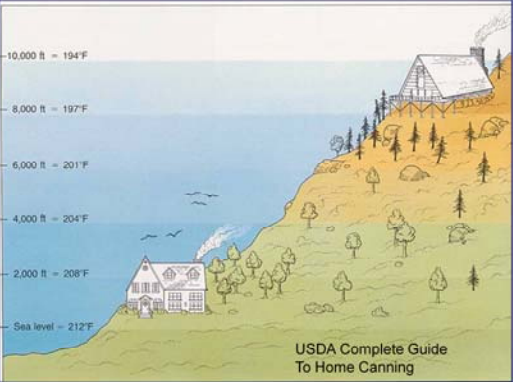

### Water Boils at Lower Temperatures as Altitude Increases

Altitude (in feet)	Temperature at which Water Boils
10,000	194°F
8,000	197°F
6,000	201°F
4,000	204°F
2,000	208°F
0 (Sea Level)	212°F

The lower temperatures are not effective for killing bacteria, processing times need to be increased for water bath canner; pressure canners need to increase pressure.

## Adjusting for Altitude

Kansas altitudes –  
<http://skyways.lib.ks.us/kansas/counties/index.html>



USDA Complete Guide  
To Home Canning

Recipes in So Easy to Preserve are based on an altitude of 0 – 1,000 feet. Tables are provided in each section to adjust for higher altitudes.

The Ball Blue Book recipes are based on an altitude of 0-1,000 feet. See chart on page 5 to adjust for higher altitudes.



You must throw away the food in any jars that do not seal.

- 1. True
- 2. False





## Steps in Preparing Jars

- Wash canning jars; don't use if chipped or scratched – keep hot until used.
- Pour hot food into jars
- Remove air bubbles
- Leave correct headspace
- Wipe jar rims with clean cloth
- Adjust lids until fingertip-tight
- Process in a boiling water bath

Wash canning jars; don't use if chipped or scratched – keep hot until used.

Pour hot sauce into jars

Remove air bubbles

Use a plastic knife or bubble freer for this so as not to scratch the jars.

Leave ½ inch headspace


- When filling the jars, it is important not to overfill. Space in the jar between the inside of the lid and the top of the food or its liquid. Check directions for the correct headspace.
- If there is too little, food may bubble out or run over during processing. Then deposits on the rim may keep the jar from sealing properly.
- If there is too much headspace, the food at the top of the jar is likely to discolor during storage, and the jar may not seal because all of the air was not forced out.
- For jelly, it is usually ¼ inch. For acid foods like fruits, tomatoes and pickles, it is ½ inch. For low acid foods like vegetables, meats and mixtures of acid and low acid foods, it is usually one inch.

Wipe jar rims with wet, clean cloth or paper towel to remove any residue.

Prepare 2-piece canning lids and ring bands according to package instructions for the brand you are using.

Adjust the two-piece lids; tighten until fingertip-tight.

Process in a boiling water bath for 35 minutes.



## Testing for Seals

- Listen for “pop”.
- Lid curved inward, won’t move when pressed.
- Clear ringing sound when tapped.



How do you test to see that jars are sealed?

There are basically three ways.

- 1) Listen for a popping sound as jars begin to cool.
- 2) The lids will curve down or inward toward the jar and will not move when pressed.
- 3) If you tap on the center of the top with a metal spoon, you will hear a clear ringing sound rather than a dull thud.

If the jars are not sealed, you can reprocess the food if everything else was done correctly and if you catch it within 24 hours.

To re-can, remove the lid and check the jar sealing surface for tiny nicks. Change the jar; if necessary, add a new treated lid and reprocess using the same processing time.

If you do not wish to reprocess, you can either refrigerate the food and use it quickly or you can freeze it for longer storage.

Use reprocessed foods first. Label them for identification. These will be softer in texture and lower in nutritional value.

## Drying Foods

- Convenient
- Lightweight
- Uses minimal space
- No refrigeration needed
- Prevents growth of microorganisms
- Slows enzyme activity



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## Drying Equipment

- Dry in dehydrator, oven, sun
  - Sun drying difficult in Kansas, too humid
- Optimum drying temperature is 140°F
- Need air circulation



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## Types of Dried Foods

- Leather
  - Fruit Leather
  - Vegetable Leather
- No visible moisture
- Dry but pliable



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## Types of Dried Foods

- **Fruit**
  - Pretreat to prevent browning
    - Ascorbic acid
    - Sulfites
    - Fruit juice
    - Honey
  - Slice thin and even
  - Peeled fruit dries best



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## Types of Dried Foods

- **Vegetables**
  - Keep pieces uniform for even drying
  - Steam or water blanch
  - Brittle or crisp



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# Types of Dried Foods

- Herbs
  - Dry in microwave or paper bag with holes
  - Food dehydrator



How to Dry Foods, Deanna DeLong



## Types of Dried Foods

- Jerky
  - Must be heated to 160°F
    - Heat in marinade prior to drying
    - Heat in 275°F oven for 10 minutes
  - Strips should be  $\frac{1}{4}$  inch thick or less
  - [www.uga.edu/nchfp/how/dry/jerky.html](http://www.uga.edu/nchfp/how/dry/jerky.html)



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## Freezing Foods

- Easy, convenient, takes little time
- Slows microorganism growth
  - Will not kill or eliminate microorganisms!
- Slows chemical changes
- Quality may be lower or undesirable when thawed



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## Chemical Changes

- Enzymes cause color, flavor, and nutrient changes
- Vegetables should be blanched
  - Destroys microorganisms
  - Removes air and shrinks product
- Fruits need browning prevention
  - Fruit Fresh, lemon juice, ascorbic acid
  - Prevents Vitamin C loss
- Products containing fat can become rancid
  - Wrap tightly to remove air



Jarden Home Brands



## Texture Changes

- Ice crystals break cell walls
  - Results in softer texture
  - Use partially thawed
- Freeze as quickly as possible
- Keep freezer as cold as possible
- Don't overload the freezer
- Freezer burn
  - Not reversible



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## Freezer Containers



Jarden Home Brands

- Moisture-vapor resistant
- Leak proof
- Withstand freezing temperatures
- Resist grease, oil, water
- Prevents off-flavors or off-odors
- Easy to seal and label





## Types of Packaging

- Rigid – glass or plastic
  - Safe for freezer
  - Wide mouth
  - Tight fitting lid
- Flexible bags or wrapping
  - Aluminum foil
  - Plastic bags
  - Freezer paper



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## Packing Fruits

- Syrup pack
- Sugar pack
- Dry or unsweetened pack



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## Packing Vegetables

- Blanch properly for each vegetable
  - Water
  - Steam
- Dry pack or Tray pack



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## Thawing Frozen Foods

- Thawing Methods
  - Refrigerator
  - Microwave
  - As part of cooking process
- Accidental Thawing
  - Check for ice crystals
  - Temperature 40°F or below
- **When in doubt, throw it out!**



## Storing Preserved Foods

- Best used within one year
- Keep canned foods in cool, dry, dark location
- Store dried foods in airtight container
- Label and date
- Frozen food storage time varies
  - [www.oznet.ksu.edu/foodsafety/Pubs/l805.pdf](http://www.oznet.ksu.edu/foodsafety/Pubs/l805.pdf)
- Cupboard storage
  - [www.oznet.ksu.edu/library/FNTR2/L806.PDF](http://www.oznet.ksu.edu/library/FNTR2/L806.PDF)

Properly cool the canned foods after processing.

When cool, check for seals.

Remove screw band so it will not rust on.

Label with day, canner batch, etc.

If the jars sealed properly, store the food in a cool, dry, dark place.

Examine all canned foods before using them.

For best quality, use home canned foods with one year.



## Questions?

- For more information or classes:  
<http://www.johnson.ksu.edu/>



### Disclaimer and Credit

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