



FOOD PRESERVATION: CANNING BASICS

Preserving Food

Main home food preservation methods

- Canning
- Freezing
- Drying

Choice of method depends upon

- Safe guidelines
- Product characteristics

To maintain safety and quality

- Microorganisms
- Enzymes



How Preservation Methods Work

- **Freezing** reduces the temperature
- **Drying** removes moisture
- **Canning** applies heat



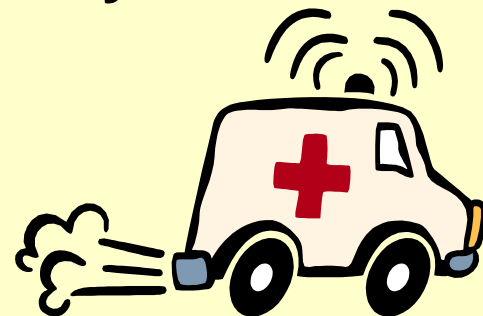
Principles of Canning

- Heat processing at specified temperature for a specified time
 - Destroy organisms
 - Inactivate enzymes
 - Oxygen driven out
- A Vacuum is formed upon cooling
 - Prevent recontamination



Home Canning Basics

- Recommend research-based recipes:
 - USDA
 - Land grant universities
 - Ball® Blue Book (dated 1989 or later)
- Time, temperature, product volume scientifically tested
- If recipe not followed correctly
 - Poor quality product
 - Food poisoning
 - Death



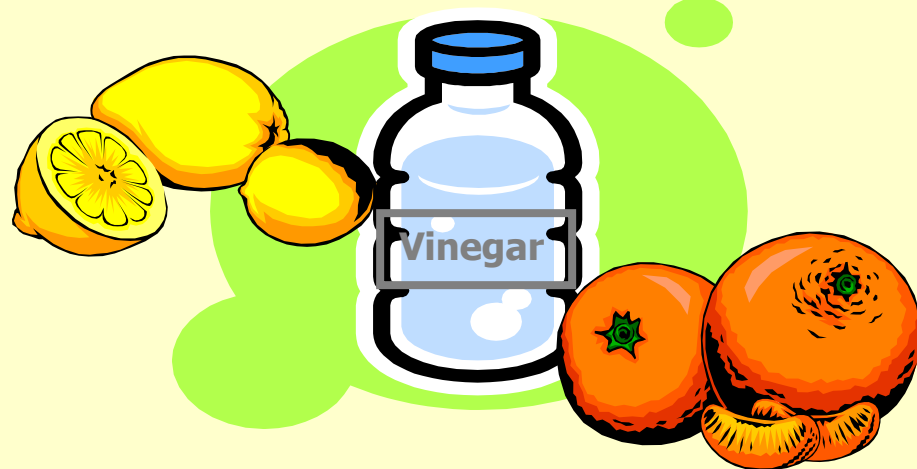
Two Approved Methods of Canning Foods At Home

- **Boiling Water Bath (212°F)**
 - Acidic foods ($\text{pH} \leq 4.6$)
 - Addition of acidic ingredients
- **Pressure Canning (240°F)**
 - Low-acid foods ($\text{pH} \geq 4.6$)
 - Mixtures of acid and low-acid foods



pH = Acidity

- **Acidity measurement = pH scale 0 – 14**
- **Low pH values = high acidity**
- **Different bacteria, different acid tolerance**
- **Bacteria grow between pH 4.6 and 9.0**
- **Bacteria thrive between pH 6.0 and 7.5**



Acidic Foods

pH < 4.6

- Fruits
- Tomatoes, figs, pears are borderline – require acidification
- Fermented foods (sauerkraut, pickles) – yeasts breakdown carbohydrates, ↑ acidity

**Can be safely
heat processed
in boiling water**



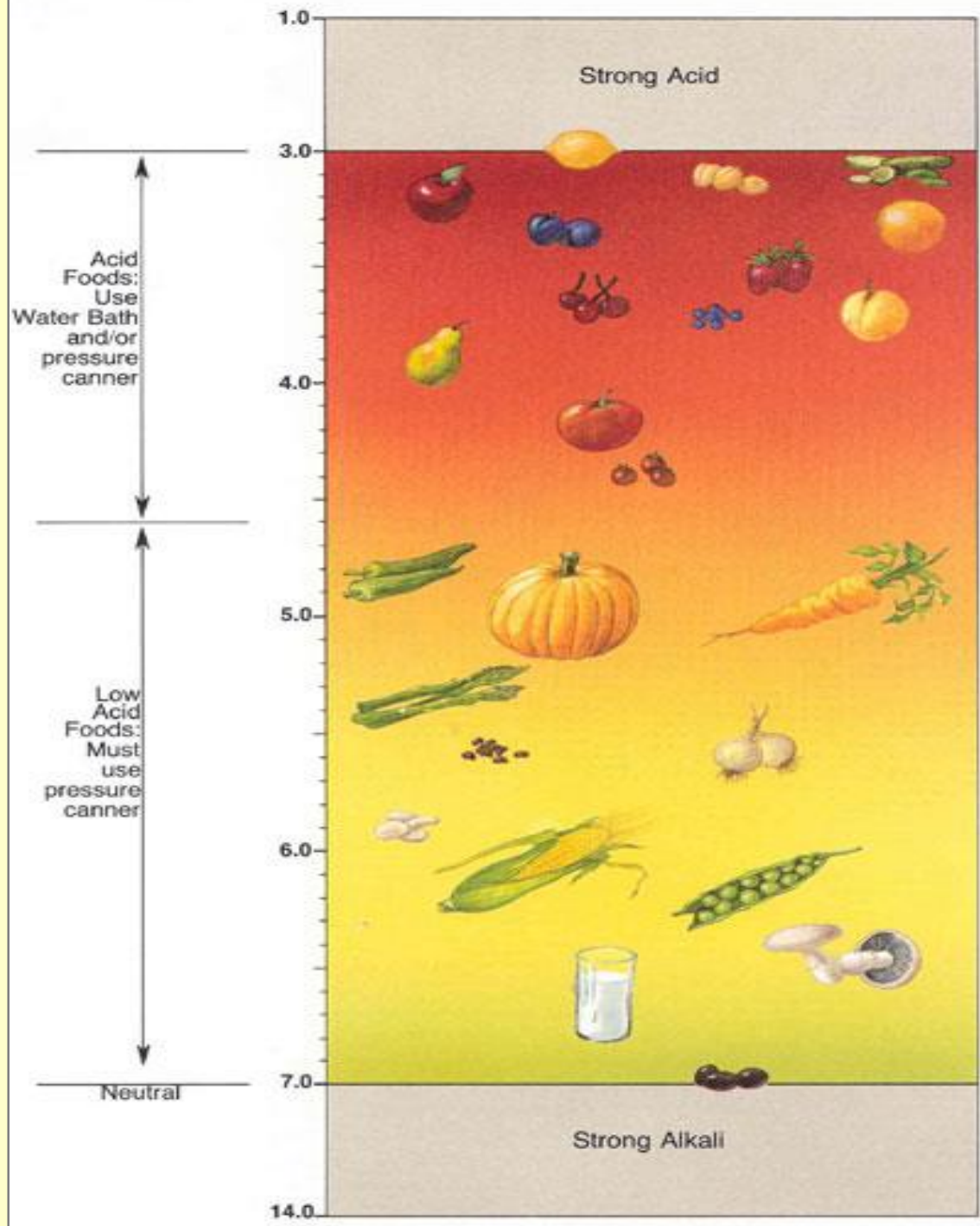
Low-Acid Foods

pH > 4.6

- Vegetables
- Meats, poultry, seafood
- Soups, stews
- Mixtures of acid and low acid foods (spaghetti sauce – meat, vegetables and tomatoes)

**Must be heat
processed in a
pressure canner**





Why Two Methods?

Clostridium botulinum

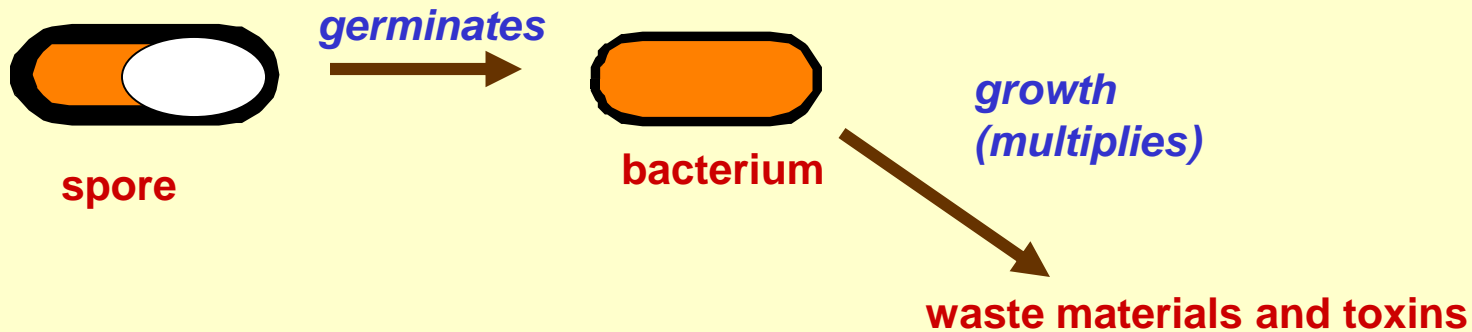
- Commonly found in soil and marine sediment
- Two forms
 - Vegetative cells
 - Spore
- Vegetative cells killed at 212°F
- Spores destroyed at 240°F
- If do not destroy spores, they will germinate into vegetative cells when conditions become favorable and produce toxin



Botulism Poisoning

Favorable conditions for *C. botulinum* growth:

- Low oxygen
- Low acidity (pH >4.6)
- Moisture
- Temperature





Botulism Foodborne Illness

- Symptoms appear within 12 to 72 hours:
 - Nausea, vomiting, weakness, dizziness
 - Blurred, double vision
 - Difficulty swallowing, speaking and breathing
 - Possible death from suffocation



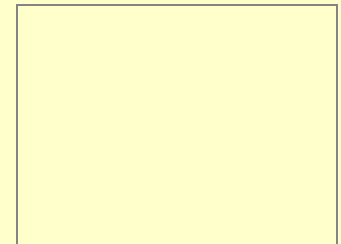
Botulism Foodborne Illness

- Potentially fatal
- Permanent nerve damage
- Food can contain toxin without showing signs of contamination
- **Improperly home canned vegetables remain the leading cause**



Foodborne Botulism Outbreaks in US

- 116 reported outbreaks from 1999-2008^a
 - 75 (91%) caused by home-prepared foods
 - 33 (44%) home-canned foods
- Home canned vegetables significant cause^a
 - Preserving low acid food improperly
 - Modifying instructions
 - Low awareness of risk of botulism



^a Journal of Food Protection, Vo. 74, No. 12, 2011, Pages 2090-2096.





Homemade holiday food baskets may give gift of botulism

As the popularity of canning rises, so do the risks — especially when newbies get creative



msnbc.com

Homemade goods — and gifts — seem to be on the rise, thanks to a sluggish economy and an overall desire to get back in touch with our food.

By Diane Mapes

msnbc.com contributor msnbc.com contributor

updated 12/13/2010 6:03:12 PM ET

Preventing Botulism

Follow the recipe- **NO MODIFICATIONS!**

Several factors affect heat penetration

- Jar
- Food

Cold-spot

- Slowest heating area of the jar
- Determines process time

Use recommended canners

- Heat-up and cool-down times in pressure canner are counted toward “sterilization”
- **DO NOT RUSH!!!**



EQUIPMENT



Equipment - Jars and Lids

Jars

- Don't use if chipped
- Keep hot
- Processing <10 min. = must be sterilized



Lids

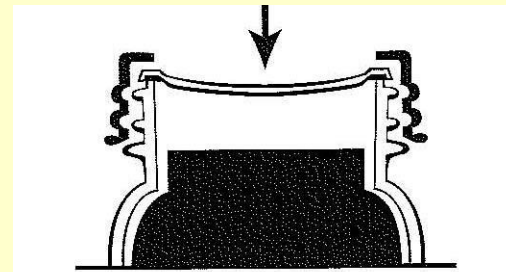
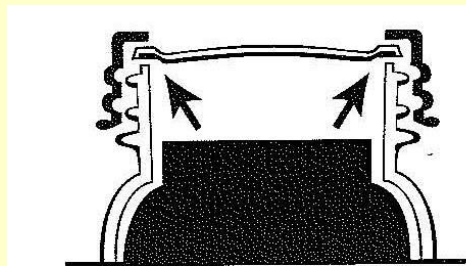
- **ALWAYS** use new flat lids
- Lid has a sealing compound filled channel
- Keep hot until used
- Threaded screw band



Vacuum Seal

- Heat-processed and cooled
- Pressure outside of jar > inside jar
 - Pushes lid down
 - Sealing compound conforms to rim
 - Creates air tight seal
- Prevents recontamination of the food

**Failure to adequately heat-process
= seal failure, food spoilage, health risks**



Packing Methods – Raw/Cold Pack

- Raw, unheated food
- Boiling liquid poured over the food
- Tightly pack fruits and most vegetables because that will shrink during processing
- Loosely pack starchy vegetables that will expand during processing



Packing Methods – Hot Pack

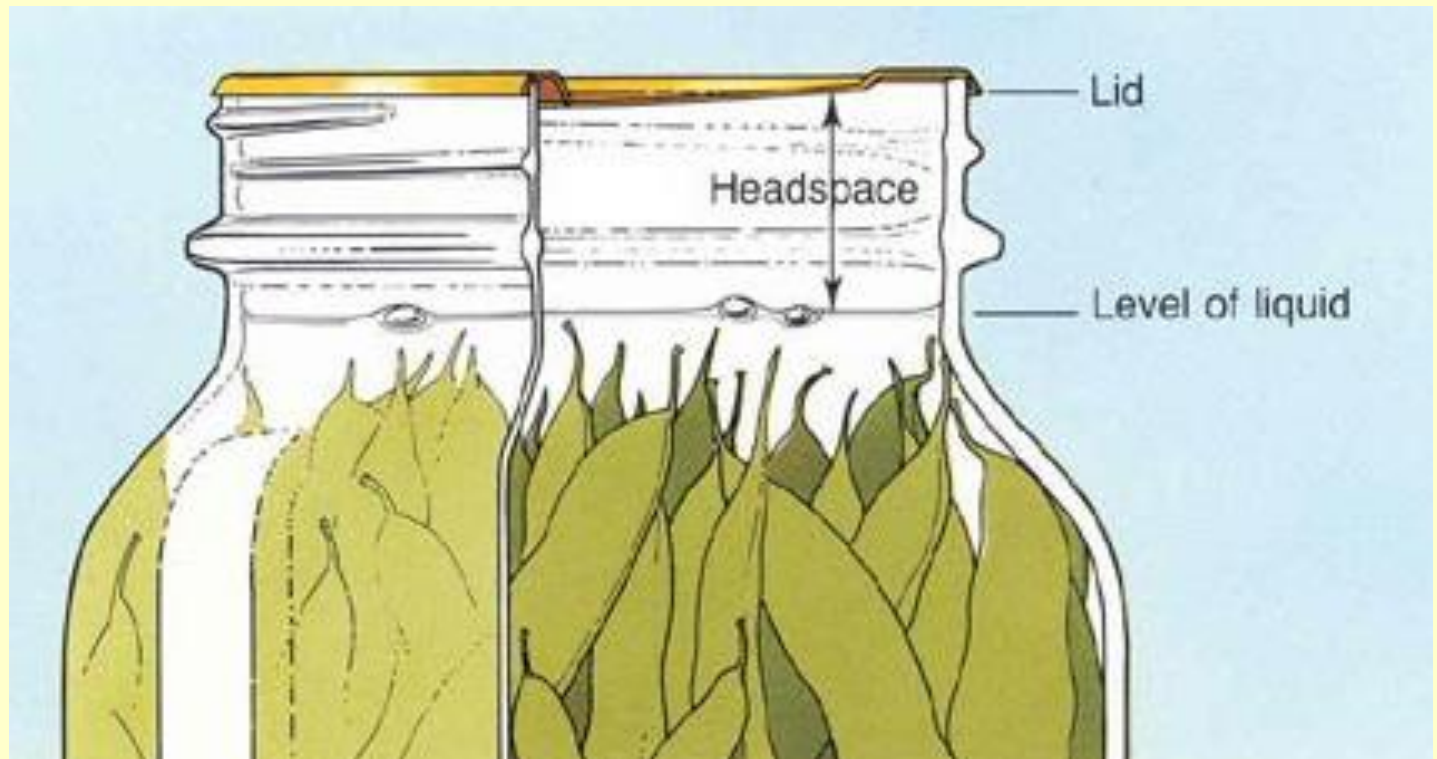
- Put hot food and boiling liquid into jars
- Pack fairly loosely because shrinking already occurred
- Make sure enough cooking liquid covers the food
- Preferred method for most foods

Note: If directions say only hot pack then hot pack!



Headspace

- Empty space
- Allows food to expand
- Allow for good vacuums to be formed



Headspace

TOO LITTLE

= PREVENT SEALING

TOO MUCH

= AIR IN JAR

= PREVENT SEALING

= FOOD DISCOLOR



Air Bubbles



- Rise during processing
 - = Too much headspace
 - = Prevent sealing

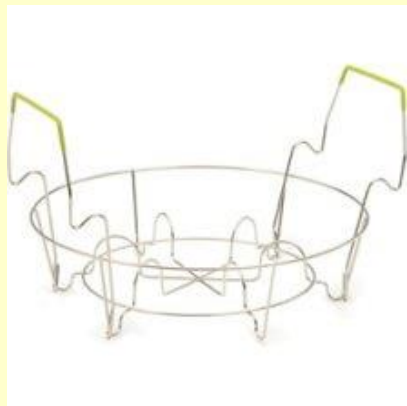
- **To prevent air bubbles**
 - Run a plastic or rubber knife-like utensil around the edges of the jar
 - Gently shift the food

- More liquid may need to be added to ensure proper headspace

Boiling Water Bath Canner

- **Water: 1-2 inches MUST cover the jars**
- **Place ALL jars in canner**
- **Start timer when water returns to a boil**
- **Cover**

- **DO NOT DISTURB** jars for 12-24 hours



Pressure Canning



- **Water: 2-3 inches**
- **Place jars in canner**
- **Heat the pressure canner until steam comes out of the vent tube**
- **Allow steam to vent for 10 min.**
- **Process times are for a pure steam environment**
- **USDA instructs to vent ALL pressure canners**
- **DO NOT DISTURB** jars for 12-24 hours

If pressure drops anytime during the process, bring the canner back up to required pressure and start timing the process over, from the beginning

Pressure Canners vs. Cookers

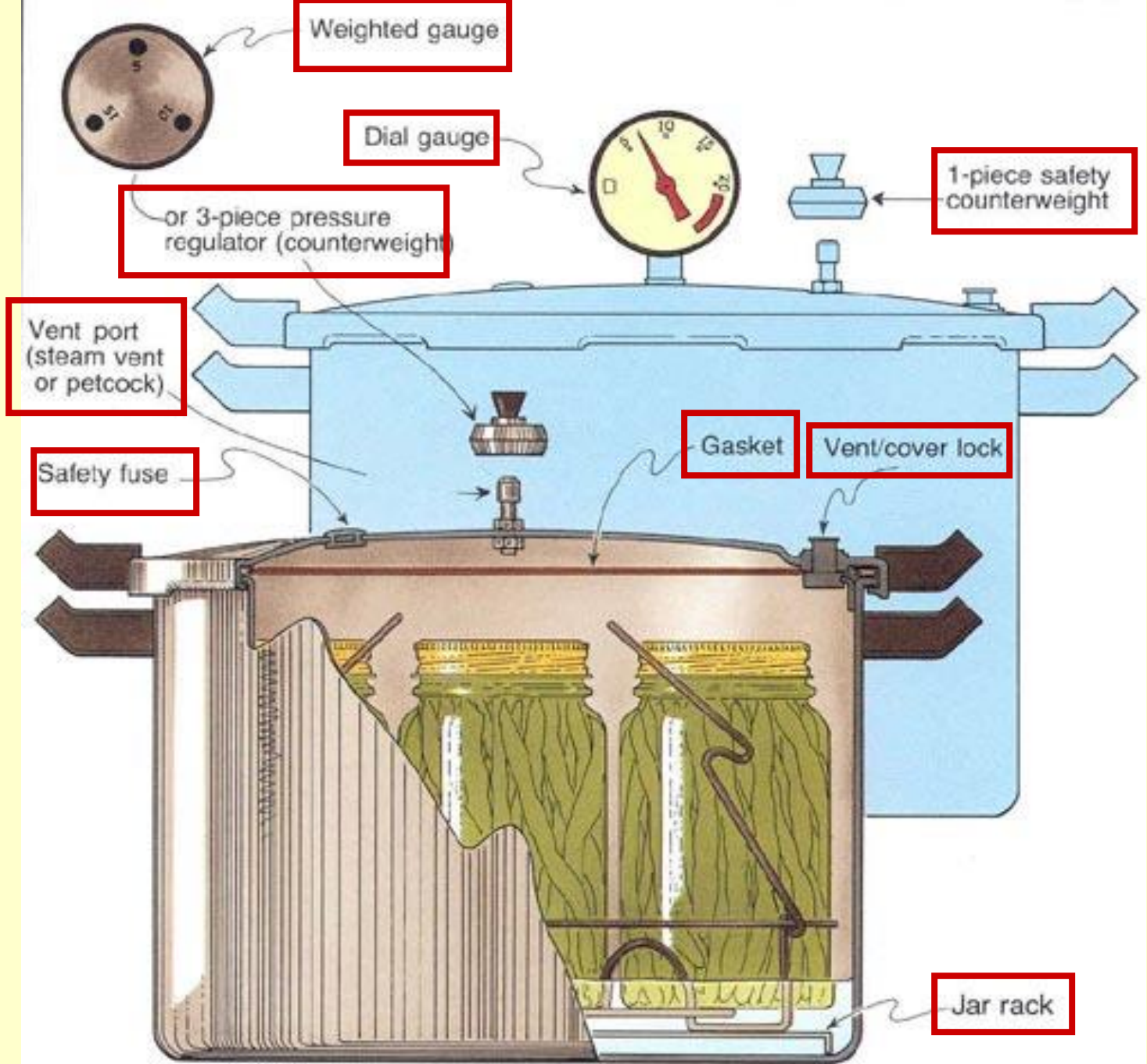
NOT INTERCHANGEABLE!

- **Canners** MUST hold at least 4 quart-size jars
- **Cookers** have less metal, smaller diameter, and use less water
 - = shorter processing time
 - = reduced heat
 - = under processed product
 - = risk of botulism!

National Center for Home Food Preservation

Preserving Food: Using Pressure Canners

http://nchfp.uga.edu/publications/uga/using_press_canners.html



Pressure Canners Features

Dial Gauge

- Indicates pressure inside the canner
- Must be checked for accuracy
- Has dead- or counter-weight to close open vent for pressurizing
- Adjust heat to maintain pressure



Pressure Canners Features

Weighted Gauge

- Weights regulate pressure inside the canner – 5, 10, 15 lb.
- Open vent is where the weights fit
- Steam, exhausted during processing, causes the weights to rock or jiggle
- Does not require testing for accuracy, but replace the weights if they become damaged



Storing Home Canned Food

- Label and date
- Store without ring bands
- Store in cool, dark, dry place
- Refrigerate unsealed jars
- Avoid temperature extremes
- For best quality, use within a year





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- So Easy to Preserve*, 5th Edition, 2006, University of Georgia Cooperative Extension Service
- Adapted with permission of the University of Georgia. Andress, E.L. 2003. *Freezing fruits and vegetables at home* (slides). Athens, GA: The University of Georgia, Cooperative Extension Service.
- Adapted with permission of the University of Illinois. Finck, J. 2011. *Drying Foods* (slides). Springfield, IL: The University of Illinois, Extension.
- Ball® Complete Book of Home Preserving, Ed. J. Kingry and L. Devine, 2006. Robert Rose Inc.

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- Elizabeth Andress and Elaine D'Sa, National Center for Home Food Preservation, University of Georgia.
- Information Staff, Agricultural Research Service, USDA.
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