

Preserving Food Safely

The Science and Sense of Food Preservation

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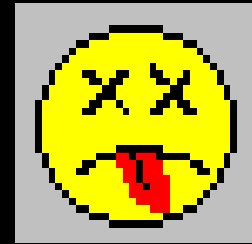
Science of Food Preservation

- Food Spoilage - Safety vs. Quality
- Causes
- Methods to Control
- Safety Review

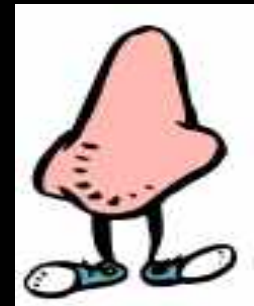


When is Food Spoiled?

- It can cause illness or death (Safety)



- It is aesthetically unpleasing
- "off" odor, color, flavor
(Quality)



Safety vs. Quality

- Food may be safe but of poor quality
- Food may be of good quality but not safe



- Ideal: Good quality and safe

Food Preservation

- Goal:
Ensure safety with best quality possible
- Often trade offs:
Enhance safety/
reduce quality



Home Food Preservation: Control Causes of Food Spoilage Using Available Methods

- Causes

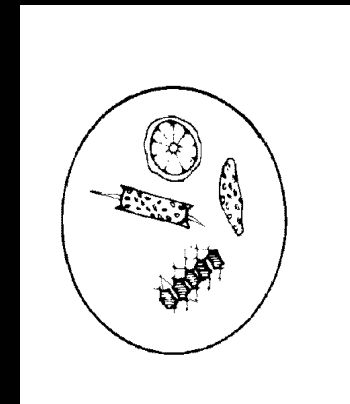
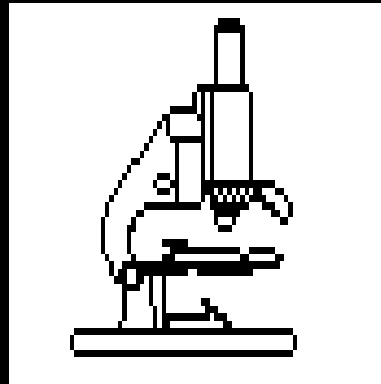
- Microbiological
- Biological
- Enzymatic Rx
- Chemical Rx
- Physical Damage

- Methods

- Cold Temperatures
- Hot Temperatures
- Reduced Available Water
- Acid content

Causes of Food Spoilage

- Microbiological
 - Bacteria
 - Yeasts
 - Molds
 - Parasites
 - Viruses



Causes of Food Spoilage

- Biological
 - Rodents
 - Insects
 - Other animals who eat/ contaminate part of the food before we do

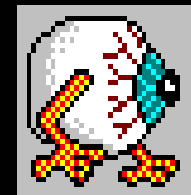


Causes of Food Spoilage

- Enzymatic Reaction
(enzymes naturally present in food
 - With oxygen and food components
 - Break down of fats, starch, protein

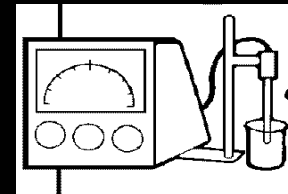
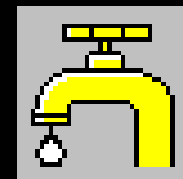
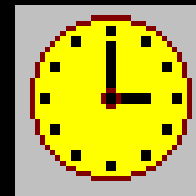
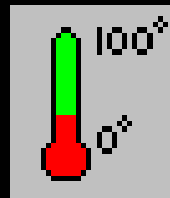
Causes of Food Spoilage

- Chemical Reaction
(With chemicals naturally present in food or from the environment (air, water))
 - Oxidation (with fats)
 - Color change (with pigments)



Factors Which Affect: Growth/ Survival of Microbes Rate of Enzymatic or Chemical Reactions

- Temperature
- Time
- Available Water
- Acidity/ pH



Preservation Methods Which Use These Factors

- Cold Temperatures
- Hot Temperatures
- Reduced Available Water
- Acid Content

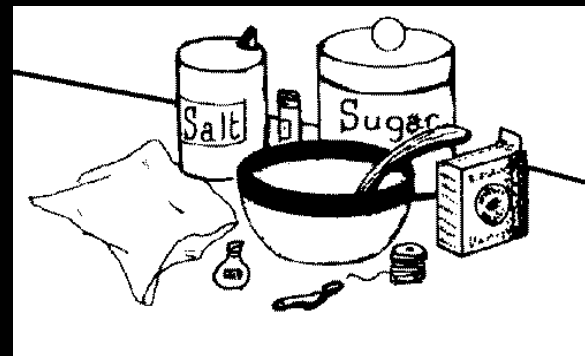
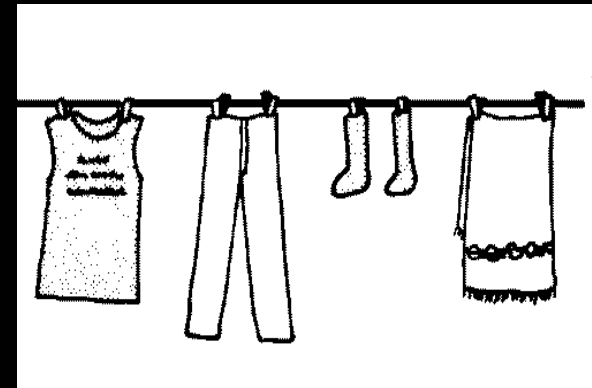
Cold Temperatures

- Refrigeration
40°F; range: 30- 60°F
- Freezing
below 0°F; range 0-10°F



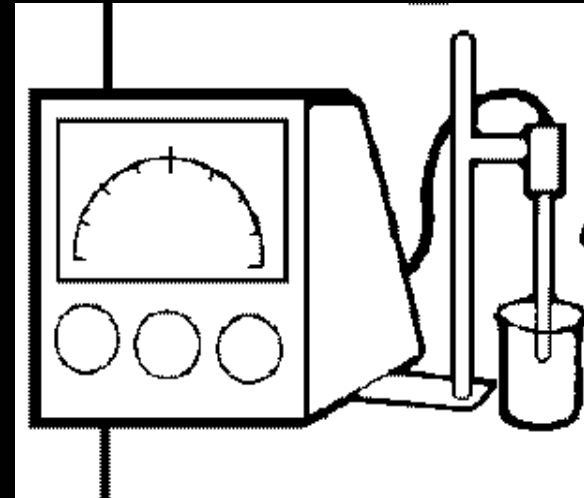
Reduced Available Water

- Remove moisture/
drying
- Add sugar or salt



Acid Control

- Fermentation
- Addition of acid
- Mixture of high- and low- acid foods



Hot Temperatures



- Blanching (~ 210°F)
- Pasteurizing or Water Bath Canning (180°F – 210°F)
- Pressure Canning (240°F or above)

Blanching

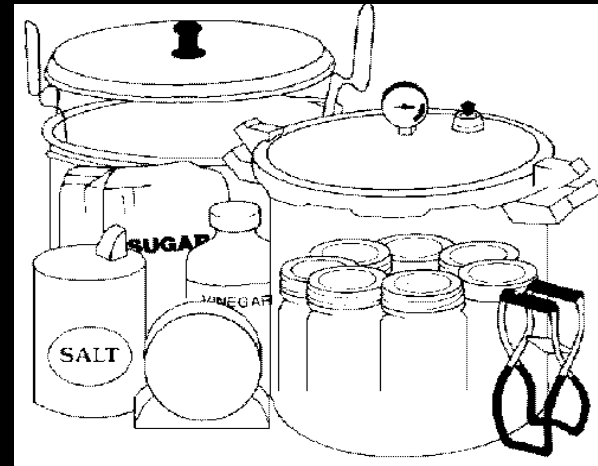
- For freezing or hot pack canning
- Inactivates enzymes which may reduce quality
- Soften tissues
- Prevents color loss
- Removes air from tissues

Pasteurizing or Water Bath Canning

- Inactivates enzymes
- Destroys or kills
 - Yeast
 - Mold
 - Growing or vegetative bacteria

Pressure Canning

- Inactivates enzymes
- Destroys or kills
 - Yeast
 - Mold
 - Growing or vegetative bacteria
 - Spores of bacteria



Pressure Canning

- Complete Sterility – total destruction of all living microbes and bacterial spores (unacceptable quality)
- Commercial Sterility – destruction of all microbes and all but the most heat resistant bacterial spores so that the food does not spoil with normal handling and storage (what is done)

Factors Influencing Canning Process

- Acid Content of Food
- Heat Transfer Mechanism
- Heat Treatment

Acid Content

pH

acidic

alkaline

0

7

14

Fruits

Tomatoes?

Vegetables

Importance of Acidity/ pH

3 high acid 4.6 low acid 7

Boiling Water Bath
Mild heat
Destroys growing or
vegetative bacteria
Acid prevents spore
growth

Pressure Canning
High heat destroys
bacterial spores

Heat Transfer Mechanism

- Conduction (slow, outside to center)
 - thick/ viscous food
- Convection (faster, water circulates)
 - Food pieces/ chunks packed in liquid

Heat Treatment

- Pressurized Steam
- Steam at atmospheric pressure
- Water
- Air

Fastest



Slowest

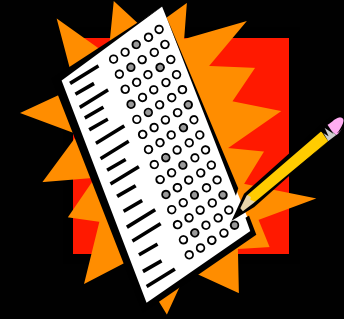
Heat Treatment – Altitude Effects

- Water boils at a lower temp at higher altitudes
 - 10,000 ft 194 F
 - 6,000 ft 201 F
 - Sea Level 212 F
- **Select proper processing time or canner pressure for the altitude where you live or product may be under heat processed**
- **MN highest elevation is 2,000 ft. U of MN Extension publications give processing recommendations based on this**

Safety Review

- Safety always comes first
- Microbes are major concern
- Control factors that prevent microbial growth (temp., time, available water, acidity)
- Only use researched methods
- Simmer/ boil home canned foods 10-12 minutes to ensure safety

Home Canning and Freezing Practices



- Telephone Survey
- National Center for Home Food Preservation, U of GA
- 501 adults from households across USA
- 10/00-1/01

Survey Results

- 27% of respondents reported canning food at home in 1999
 - 48% of these obtained their canning instructions from friends or relatives
 - 19% consulted cookbooks
- 67% reported using their home-canning instructions "as is", 29% adapted them for use

Survey Results



- Most Common products canned:
 - Vegetables (71% of respondents)
 - Tomatoes/tomato products (60%)
 - Fruits and fruit products (47%)

Survey Results



- Method used for canning fruits and tomatoes
 - Boiling water canner (58% of 103 respondents)
 - Pressure canner (15.5%)
 - Pressure cooker (18%)
 - "Open-kettle"/ no processing after filling (21%)
 - Oven (4%)

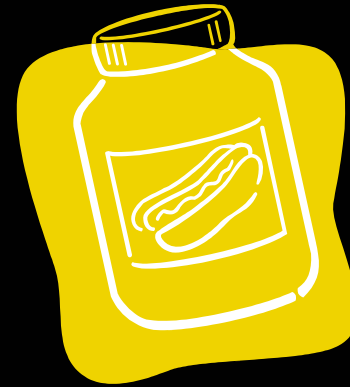
Survey Results



- Methods used for canning vegetables and other low acid foods
 - Pressure canner (30% of 96 respondents)
 - Pressure cooker (29%)
 - Boiling water canner (39%)
 - Open-kettle method (15%)
 - Oven (3%)

Many people are using methods putting them at high risk for foodborne illness from home-canned vegetables, including botulism.

Survey Results



- Jar seals
 - No failures (62%, 84 respondents)
 - Failures (38%, 51 respondents)

Home Food Preservation Resources

- U of MN Publications and Info-U Briefs
http://www.extension.umn.edu/foodsafety/components/homefood_safety.htm
- Your State Extension Service
http://www.csrees.usda.gov/qlinks/partners/state_partners.html
- National Center for Home Food Preservation Publications
http://www.uga.edu/nchfp/publications/publications_home.html

Home Food Preservation Resources

- Alltrista Consumer Products Company
<http://www.homecanning.com/>