

Introduction to Food Processing

Why process foods?

1. Prevent, reduce, eliminate infestation of food with microbes, insects or other vermin
2. Prevent microbial growth or toxin production by microbes, or reduce these risks to acceptable levels
3. Stop or slow deteriorative chemical or biochemical reactions
4. Maintain and/or improve nutritional properties of food
5. Increase storage stability or shelf life of food
6. Make food more palatable and attractive
7. Make foods for special groups of people

1. Prevent, reduce, eliminate infestation of food with microbes, insects or other vermin

1 - keep it clean

2- keep 'em out

3- kill 'em (if you can)

Processing methods designed to **keep foods clean:**

- packaging (primary, secondary)
- cleaning (mechanical, chemical)
- milling grain

Processing methods designed to **keep 'em out:**

- packaging
- sanitation
- good manufacturing practices

Processing methods designed to kill 'em:

- Thermal processing –
commercial sterility – 12D process for *C. botulinum* spores.
pasteurization - designed to kill only vegetative cells of pathogens, not spores

Processing methods designed to **kill 'em:**

- **Non thermal processes**

- **Radiation**

- irradiation (gamma, ultraviolet)

- **High pressure processing**

- Vegetative cells only

- Spores – only if coupled with heating

Processing methods designed **to kill 'em:**

- **Chemical treatments**
sanitizer chemicals, peroxides, acids,
bacteriocins (nisin), controlled
atmosphere
- **Combinations** of heat, nonthermal
processes, chemicals

2. Prevent microbial growth or toxin production by microbes, or reduce these risks to acceptable levels- Processing methods

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- pasteurization
- freezing
- refrigeration

2. Prevent microbial growth or toxin production by microbes, or reduce these risks to acceptable levels- Processing methods

- reduce water activity
 - dehydration
 - curing (high salt w/ or w/o nitrite) – reduces water activity
 - add sugar (*e.g.* jams and jellies), gums or gels

2. Prevent microbial growth or toxin production by microbes, or reduce these risks to acceptable levels- Processing methods

- acidification including microbial fermentations
- biotechnology - natural pesticides (Bt), pesticide resistant plants (*e.g.* Roundup resistant)

2. Prevent microbial growth or toxin production by microbes, or reduce these risks to acceptable levels- Processing methods

- preservatives
- modified atmosphere packaging (carbon dioxide - inhibits *S. aureus*, *Salmonella sp.*, *Yersinia enterocolitica*, *E. coli*, NOT *C. botulinum*)
- combinations of these

3. Stop or slow deteriorative chemical or biochemical reactions

- Freezing – food ‘chemically active’ until -40°F
- Refrigeration – slows but does not stop
- Dehydration
- Fermentation
- Genetic engineering ('Flavrsavr' tomato)

3. Stop or slow deteriorative chemical or biochemical reactions-Additives

- Sulfiting agents
- Antioxidants, "antioxidant synergists"
- Buffering agents
- Chelating agents
- Preservatives
- Enzymes (glucose oxidase/catalase)
- Sacrificial additives (added lysine, glucose)

3. Stop or slow deteriorative chemical or biochemical reactions

- Packaging
 - exclude oxygen or reduce to 1-3%, exclude moisture & light
 - modified atmosphere - inhibits spoilage organisms, limits oxidative reactions (including those affecting color)
- Combination of these

3. Stop or slow deteriorative chemical or biochemical reactions

- Thermal processing
- Non-thermal processing (UHP) – inhibits different rxns by different mechanisms than heating

4. Maintain and/or improve nutritional properties of food

- thermal processing (commercial sterility, pasteurization)
 - blanching w/ freezing
 - refrigeration
- enrichment or fortification (vitamins, minerals)
- 'nutrient enhanced' (added vitamins, mineral, protein, fiber)

4. Maintain and/or improve nutritional properties of food

- genetic engineering (*e.g.* high lysine corn)
- antioxidants, free radical scavengers and chelating agents
- packaging (exclude light, oxygen)
- combinations of these

5. Increase storage stability or shelf life of food

- Processing
 - thermal processing
 - refrigeration
 - freezing
 - dehydration
 - fermentation
 - curing and smoking

5. Increase storage stability or shelf life of food

- Preservatives
- Antioxidants, free radical scavengers and chelating agents
- Packaging
- Combinations of these

6. Make food more palatable and attractive

processing techniques

- thermal processing (to inactivate enzymes, modify texture, flavor, color)
- freezing
- refrigeration
- dehydration
- fermentation
- curing and smoking
- grain milling and grinding; flour

6. Make food more palatable and attractive

- hydrogenation of fat
- functional additives
 - colorants including whitening agents
- add components
 - flavorants
 - humectants
 - preservatives
 - antioxidants
 - packaging
- combinations of these

7. Make foods for special groups of people

- infant foods
- geriatric foods (*e.g.* Ensure)
- nutraceuticals/ functional foods
- ethnic foods
- food service/institutional products
- convenience foods
- reduced calorie/fat/sodium foods