Keeping Food Safe

Factors that contribute to foodborne illness

1. Time and temperature abuse

2. Poor personal hygiene , improper handwashing

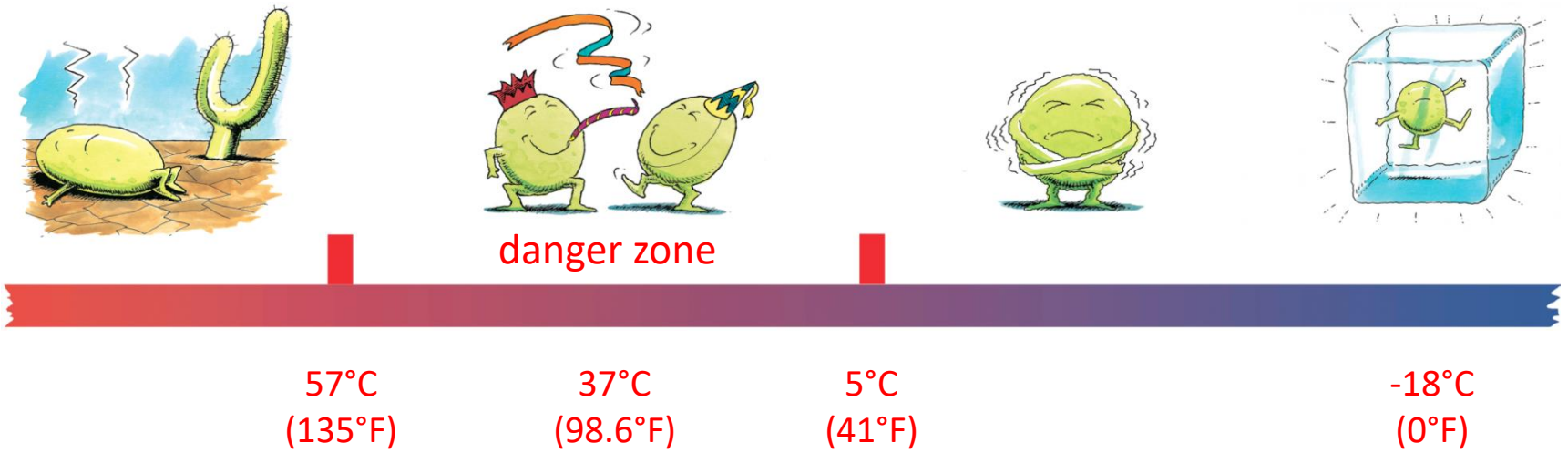
3. Cross contamination

1. Contaminated ready to eat foods

Temperature abuse

- When foods exposed to temperature in the danger zone for enough time to allow growth of harmful MO
- If food not cooked or reheated sufficiently to destroy harmful MO

The danger zone



Time-temperature control: general rules

- Keep hot food hot
- Keep cold food cold
- Keep frozen food frozen

- Or do not keep food at all

Unavoidable situations when food must pass through the temperature danger zone

- Cooking
- Cooling
- Reheating
- Food preparation (slicing, mixing, etc..)

- Foods should pass as fast as possible in TDZ
- Should pass as few times as possible → cooled and reheated once!!!

Temperature control

- Transportation
- Delivery
- Storage
  - refrigerated
  - frozen
  - dry
- Preparation
- Thawing
- Cooking
- Cooling
- Reheating
- Holding
- Service

Temperature measuring devices

To ensure the accuracy of readings, calibrate devices:

- before they are first used
- at regular intervals, as a matter of course
- after damage
- after an inaccurate reading is suspected
- whenever there is a confirmed case of foodborne illness linked to temperature abuse

General guidance for checking the temperature of TCS food

Stage of food handling	When to check temperature
DELIVERY	Every time food is delivered
STORAGE	
Refrigeration	Daily, at least
Refrigerated display	Daily, at least
Freezer	Daily, at least
Dry	Regularly
THAWING	Whenever food is thawed
COOKING	Whenever food is cooked
COOLING	Whenever food is cooled
REHEATING	Whenever food is reheated
HOT HOLDING	Frequently throughout the holding period
COLD HOLDING	Frequently throughout the holding period

THERMOMETER	FEATURES/USES
Dial face, metal stem type *(bi-metallic)*  *Courtesy of Cooper Instrument Corp.*	• Most common type of thermometer used • Used to measure internal food temperature at every stage in the flow of food • Measures temperatures ranging from 0°F (-18°C) to 220°F (104°C) with 2°F increments • Stem of bi-metallic thermometer must be inserted at least 2 inches into the food item being measured
Digital  *Courtesy of Cooper Instrument Corp.*	• Displays the temperature numerically • Measures a wider range of temperatures than a dial face thermometer
Thermocouple  *Courtesy of Cooper Instrument Corp.*	• Provides a digital readout of the temperature • Has a wide variety of interchangeable probes • Sensing portion is often at the tip of the probe
Infrared  *Courtesy of Raytek Corporation*	• Measures the surface temperature of food without actually touching the food (reduces the chance of cross contamination) • Requires about 20 minutes to adjust after use for hot and cold temperatures ("thermal shock") before use • Accuracy must be checked frequently

Steps in the Flow of Food	Safe Temperature Guidelines	Rationale for Temperature Guidelines
Receiving and Storing Frozen Foods	Foods should be frozen solidly and maintained frozen at all times.	Proper freezing of foods helps to maintain food quality and prevents the growth of spoilage and harmful microorganisms.
Receiving and Storing Refrigerated Foods	Foods should be received and stored so that food is always at or below 41°F (5°C). Raw shell eggs may be received at 45°F (7°C) or below.	Receiving and storing foods below 41°F (5°C) prevents or slows the growth of harmful microorganisms.
Cooking Foods	Different foods, and the methods by which they are cooked, require different end point temperatures to be safe. The range of safe cooking temperatures can vary from 145°F (63°C) to 165°F (74°C). Beef roasts may be cooked at 130°F (54°C) for rare. Foods should reach the required final cooking temperature within 2 hours.	Proper cooking destroys harmful microorganisms that may be present in the food.
Cooling Foods	During cooling, food must be cooled from 135°F (57°C) to 70°F (21°C) within 2 hours and from 135°F (57°C) to 41°F (5°C) within 6 hours.	Proper cooling prevents the conversion of sporeforming bacterial cells to vegetative bacterial cells and the growth of vegetative bacterial cells.
Reheating Foods	All reheated foods must be reheated to at least 165°F (74°C) within 2 hours.	Proper reheating destroys harmful bacteria that may be present in foods.

Figure 3.6 Time and Temperature Controls for Potentially Hazardous Foods (cont.)

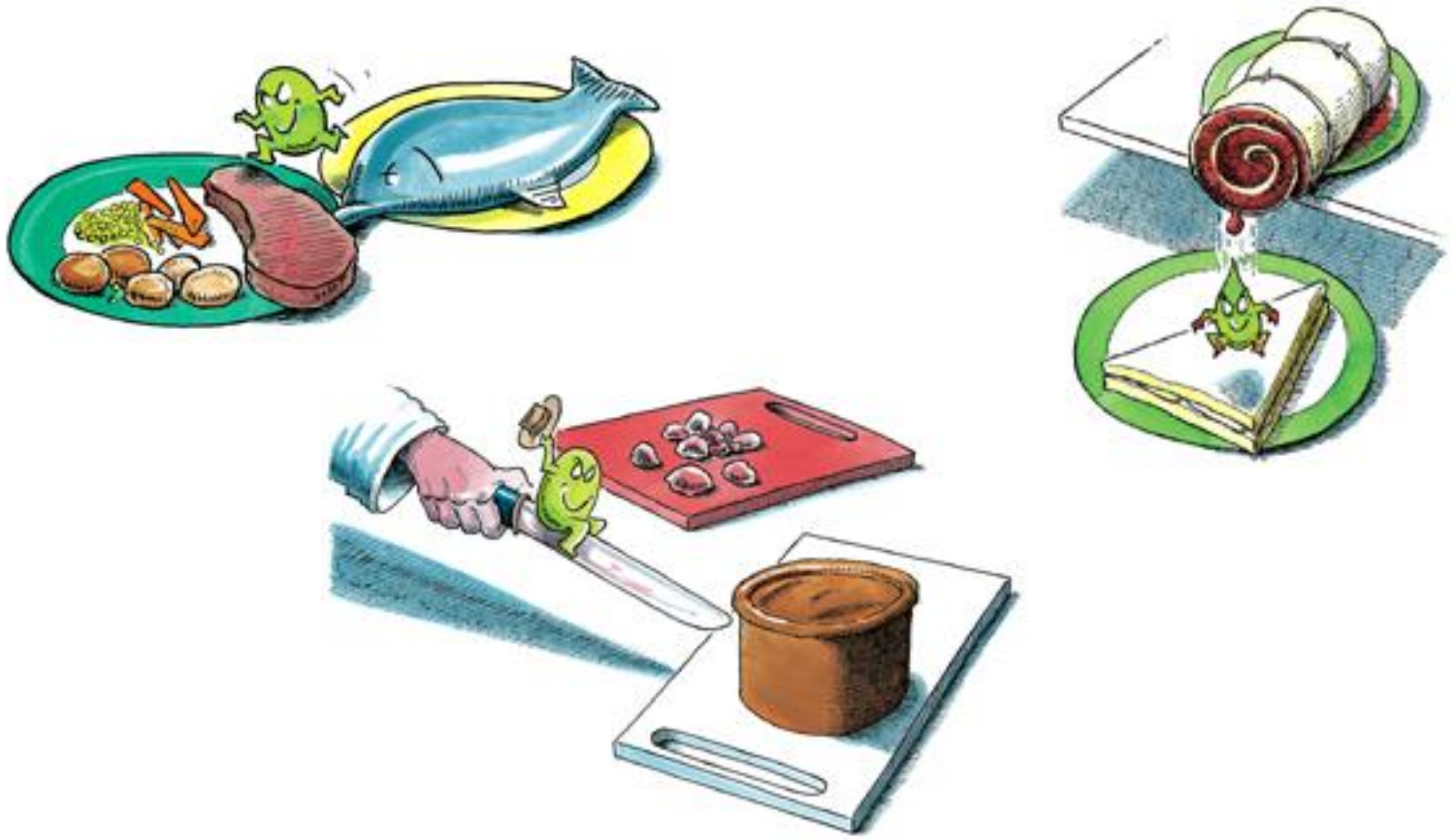
Steps in the Flow of Food	Safe Temperature Guidelines	Rationale for Temperature Guidelines
Hot-Holding Foods	All foods must be cooked to a safe temperature and then held at greater than 135°F (57°C).	Proper holding of food prevents the growth of harmful bacteria.
Cold-Holding Foods	All foods that are held and served cold must be held at 41°F (5°C) or below.	Holding cold foods below 41°F (5°C) prevents or slows the growth of harmful microorganisms.
Thawing Foods	Thawing may be done in a refrigerator at 41°F (5°C) or less, in a microwave oven and then immediately cooked, or under cool running water at 70°F (21°C).	Proper thawing prevents or reduces the growth of harmful bacteria.
Food Preparation	During food preparation, food should only be in the temperature danger zone [between 41°F (5°C) and 135° F (57°C)] for a maximum total time of 4 hours.	Maintaining foods between 41° (5°C) and 135°F (57°C) for no more than 4 hours limits the number of microorganisms that can grow.

Figure 3.6 Time and Temperature Controls for Potentially Hazardous Foods

Cross contamination

- Transfer of germs from one food to another

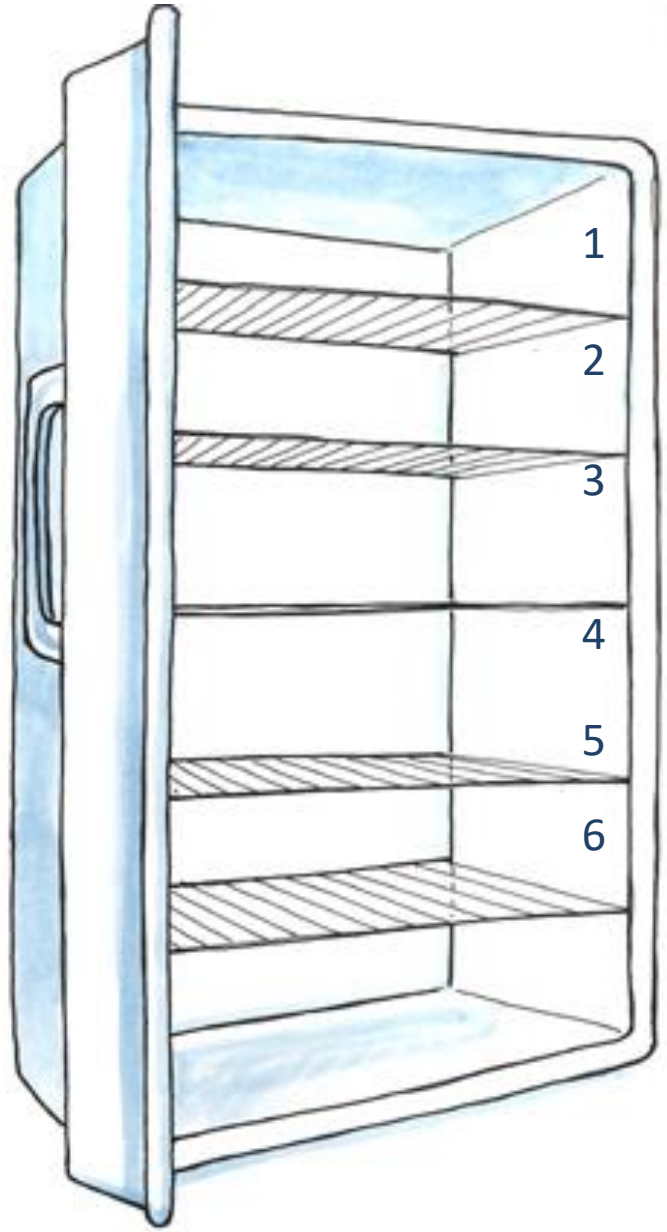
- This is commonly happens when germs from raw foods are transferred to cooked or ready to eat foods via contaminated hands, equipment, or utensils



Cross contamination

- Can also be happened of raw foods are stored above ready to eat foods.
- Juices from the raw product can drip or splash onto a ready to eat food

- Prevention tips:
  - Always store cooked & RTE foods over raw products
  - Keep raw and RTE separate during storage
  - Good personal hygiene
  - Keep all food contact surfaces clean and sanitary
  - Avoid bare hand contact with RTE FOODS
  - Separate equipment for raw and RTE
  - Prepare RTE first, then raw foods
  - Prepare both of them at separate areas



Following the food product flow

Strategies for determining food quality

- **Sensory evaluation** : commonly used method for making routine quality determinations on foods received at food establishments

- Involves using senses of smell, touch, sight, and sometimes taste
- Observe :
  - Color, texture, and visual evidence of spoilage
    - Spoilge: slime formation, mold growth, discoloration
  - Check for tears, punctures, dents, other signs of damage

Sensory evaluation of foods

- Smell :
  - Flavor (combination of smell and taste)
  - Foul odors (ammonia, hydrogen sulfide : the smell of rotten eggs)
    - These odors are caused by bacterial breakdown of protein in spoiled foods

- Taste :
  - Flavor
  - Loss of good taste
  - Development of objectionable taste
  - Alcoholic flavor or smell (by yeast spoilage)
  - Acidic taste (spoiled milk)

Spoilage cannot be used as an indicator of food safety!!!

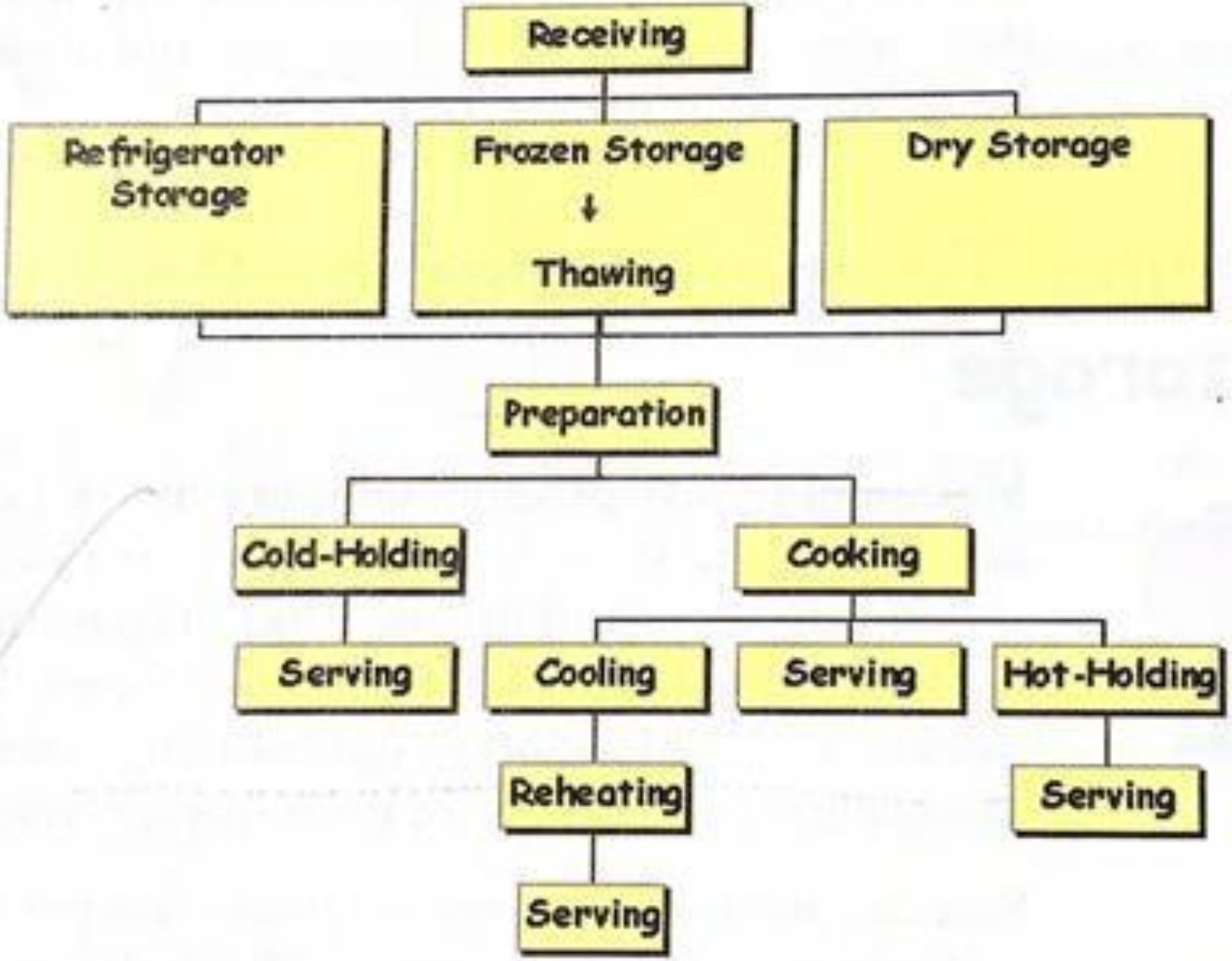
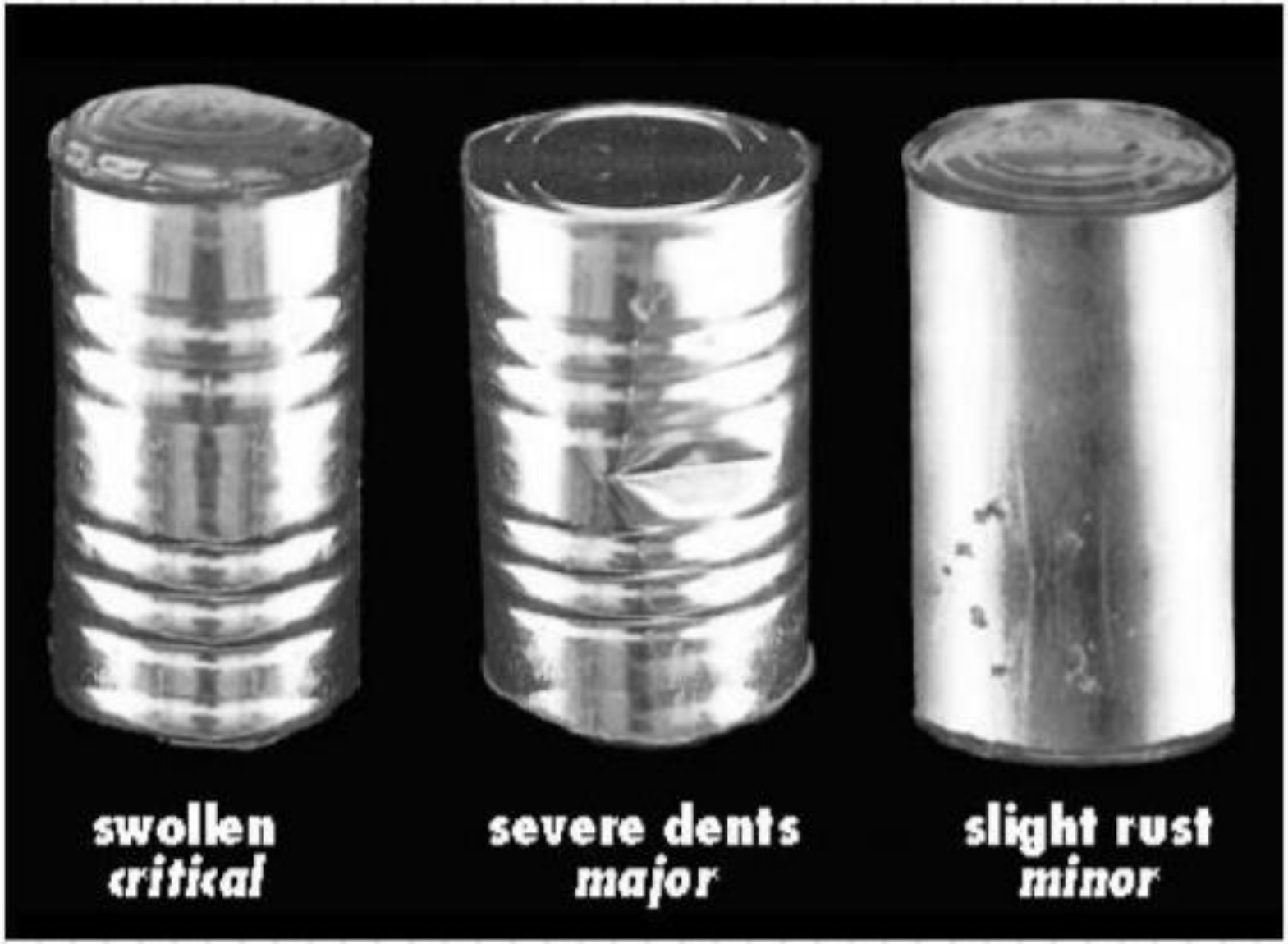


Figure 4.2 Food Flow Diagram

Receiving

Foods	Check for
Packaged foods	• Hermetic packaging • Leaks , bulges, dents, broken seals, damage along seams, rust, missing labels • Swollen: gas inside (may be caused by chemical reaction between food and metal , or growth of microbes)



- Severe dent in can seams

- Deep dents in can body
- Crushed cans that are not stackable

- Missing labels
- Unreadable labels due to stains or tears
- No code dates

- Swollen or bulging ends

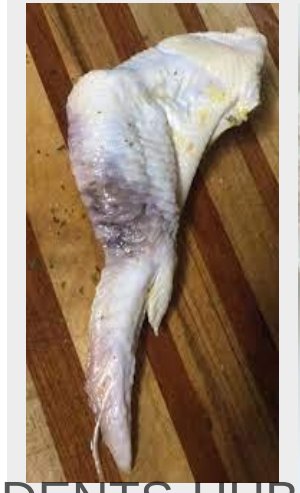
- Holes
- Visible signs of leaking (indicated by stained labels)

- Rust that cannot be wiped off

Foods	Check for
Red meats products Cattle , veal, ham, pork, sheep, lamb	• Potentially hazardous foods • Never accept fresh meat if temp. exceeds 5 C at delivery • Fresh meats should be firm, elastic to the touch, characteristic aroma • No off odors • No sliminess • Frozen meat should be solidly frozen • No signs of thawing and refreezing like ???? • Packaging to prevent freezer burn

Freezer burn

Foods	Check for
Poultry Chicken, turkey, duck, geese	• High moisture, near neutral ph, high protein → ideal condition for bacterial growth • Especially in intestinal tract, and skin !! • Spoilage is indicated when: ❑ Soft tissue , slimy, objectionable odor ❑ Stickiness under the wings • Darkened wing tips (sign of drying or freeze burn • Should be rejected if received fresh at temp. > 5 C



FRESH
Springy flesh

STALE
Stiff or soft flesh

Foods	Check for
Eggs	• Salmonella enters the egg yolks as it is formed inside the hen • Egg shell may be contaminated with salmonella especially if the egg is soiled with chicken droppings ! • Raw shell eggs should be clean, fresh, free of cracks, checks • Refrigerated at 7 C or below • When opened, should have no noticeable odor, yolk should be firm and cling to the white • Washing eggs can increase contamination !!!

Foods	Check for
Egg products Egg without its shell Liquid Frozen Dry	• All should be pasteurized

Foods	Check for
Milk and milk products Milk Cheese Butter ice-cream	• Should be pasteurized • UHT milk → ultra high temperature in aseptic packaging • Can be stored several weeks if kept under refrigeration • Fluid milk : below 5 C • Cheese : below 5 C, proper color, flavor, and moisture • Should be rejected if it contains molds • Butter : should has firm texture, even color, free of mold

G

Traditional Pasteurization:
- High Temperature Short Time Pasteurization (HTST)
- Heated to 165°F for 15 seconds
- Perishable with a 2 to 3 week shelf life

UHT Pasteurization:
- Ultra High Temperature Pasteurization (UHT or UP)
- Heated to 280°F for 2 seconds
- Perishable with a 1 to 2 month shelf life (until opened)

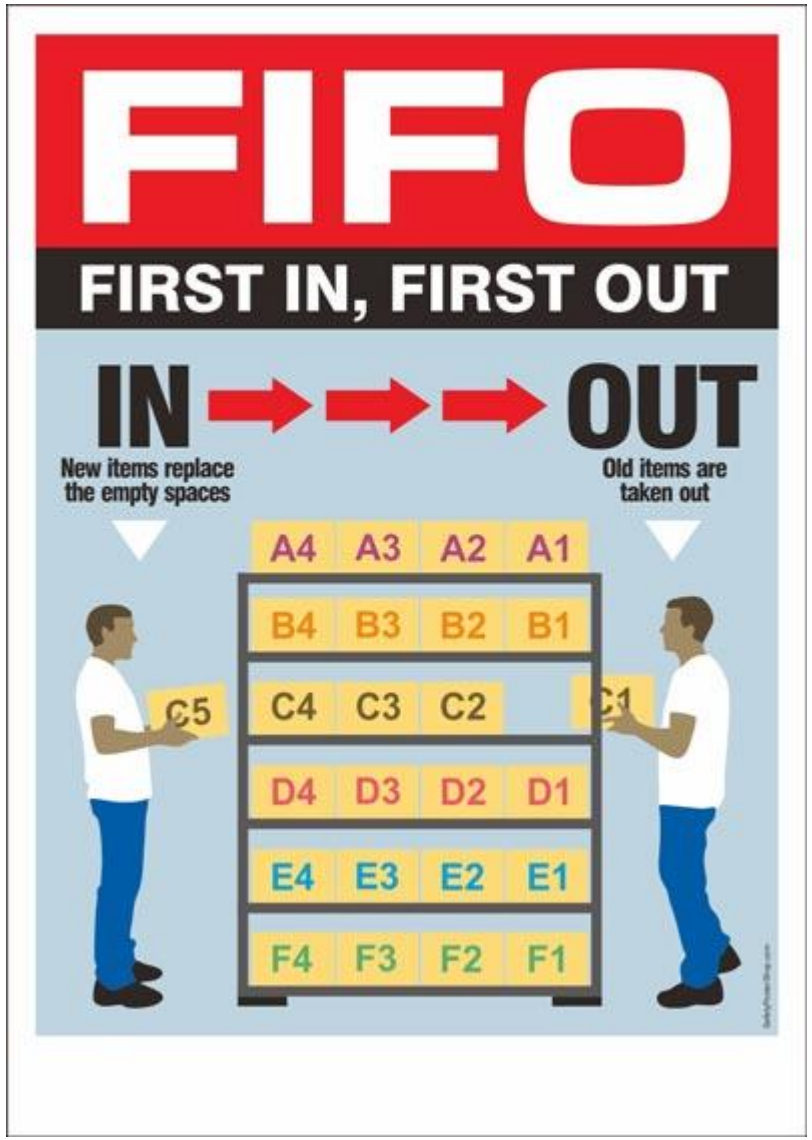
UHT Pasteurization + Aseptic Packaging:
- Ultra High Temperature Pasteurization (UHT or UP)
- Heated to 280°F for 2 seconds
- Put in a sterile "box" like package (called aseptic)
- Shelf stable for 6 months (until opened)

Foods	Check for
Vegetables and fruits	• Spoil very rapidly • They continue to ripen even after picking • Be careful of mushroom packaging → holes should be made to permit respiration • Washing thoroughly for fruits and vegetables • Vegetable detergents can be used

Foods	Check for
Fish	• More perishable than red meats , even when stored in refrigerators • Should be received at self draining ice to prevent drying, and increase the shelf life • Slime cover on fish and shellfish contains large amount of bacteria • Fish contains a lot of unsaturated fatty acids→ can be oxidized → off flavor → rancid • Smell, appearance

Storage

- The most important part of effective food storage is the stock rotation
- FIFO (first in first out)
  - Help ensure that older foods ae used first
  - Product containers should be labeled with date to help food workers know which product has been in storage longest



Types of storage

- Refrigerator
  - For potentially hazardous foods and perishable foods for relatively short period of time (days)
  - Slows down microbial growth and preserve quality
- Freezer
  - Hold foods for longer periods (weeks to months)
- Dry storage .
  - To store less perishable foods

Refrigerated and frozen storage

- Fresh fruits and vegetables
- Potentially hazardous foods
- Fish and shellfish
- Read more in book …

Dry storage area

- Moderate room temperature
- Relative humidity
- Windows are not recommended
- Slatted shelves , 6 inches off the floor and away from the wall
  - Permits cleaning between shelves, discourages insects and rodents

Storage conditions for foods

Food type	Storage conditions
Fresh meat	Relatively high humidity , refrigerated -> prevents excessive drying and shrinkage
Frozen meats	-18
Fresh poultry	Refrigerated , low humidity to prevent sliminess due to excessive bacterial growth
Whole shell eggs	Refrigerated , covered, away from foods with strong odors like onions
Egg products	Once dry eggs have been reconstituted, they became potentially hazardous foods
Milk	Can pick up odors from nearby foods
Fish and shellfish	More perishable even when refrigerated or frozen * If stored in crushed ice should be stored under other foods

Food type	Storage conditions
Fruits	Should be stored in refrigerators with good air circulation During respiration and ripening, fresh fruits give off carbon dioxide and water → they become wilted and lose flavors
Vegetables	Low temperature and high humidity to presereve texture, tenderness, flavor, color, and nutritive content

Food	Freezer	Refrigerator
Meat and Fish		
Bacon (opened)	1-2 months	5-7 days
(unopened)	1-2 months	2 weeks
Deli meat wleds	N/A	3-5 days
Fish (fresh)	3-6 months	1-2 days
(cooked)	1 month	3-4 days
(smoked)	4-5 weeks	10 days
Ground beef	3-4 months	1-2 days
Ham (sealed in can)	N/A	6-9 months
Hot dogs (unopened)	1-2 months	2 weeks
(opened)	N/A	5 days
Luncheon meats (unopened)	1-2 months	2 weeks
(opened)	N/A	1 week
Meat pie or casserole	3 months	2-3 days
Meats (fresh)	3-6 months	3-7 days
Meats (ground)	3-4 months	1-2 days
Pork chops	3-4 months	2-3 days
Sausage (fresh)	3-4 months	1-2 days
Poultry and Eggs		
Poultry (cooked)	2 months	1-2 days
Poultry (fresh)	6 months	2 days
Eggs (in shell)	N/A	2 weeks
(hard-cooked)	N/A	1 week
Egg substitutes (unopened)	1-2 months	10 days
(opened)	N/A	3 days
Dairy		
Butter	10 months	2 weeks
Cheese, herd (unopened)	1-2 months	3-6 months
(opened)	N/A	3-4 weeks
(sliced)	N/A	2 weeks
Cottage cheese	N/A	10-30 days
Cream cheese	1-2 months	2 weeks
Margarine (stick form)	12 months	"use by" date
Milk	1 month	"use by" date
Sour cream	N/A	2-4 weeks
Yogurt	N/A	1-2 weeks
Fruit and Vegetables		
Asparagus (fresh)	N/A	2-3 days
(frozen)	1-2 months	1 day
Broccoli (fresh)	N/A	3-5 days
(frozen)	1-2 months	1 day
Cabbage (fresh)	N/A	1 week
Carrots (fresh)	N/A	2 weeks
Cauliflower (fresh)	N/A	1 week
Celery	N/A	7-10 days
Corn (fresh)	N/A	1 day
Fruit (fresh	9-12 months	3-5 days
(dried)	1 year	4 days (cooked)
Lettuce	N/A	1 week
Vegetables (canned, opened)	N/A	1-4 days

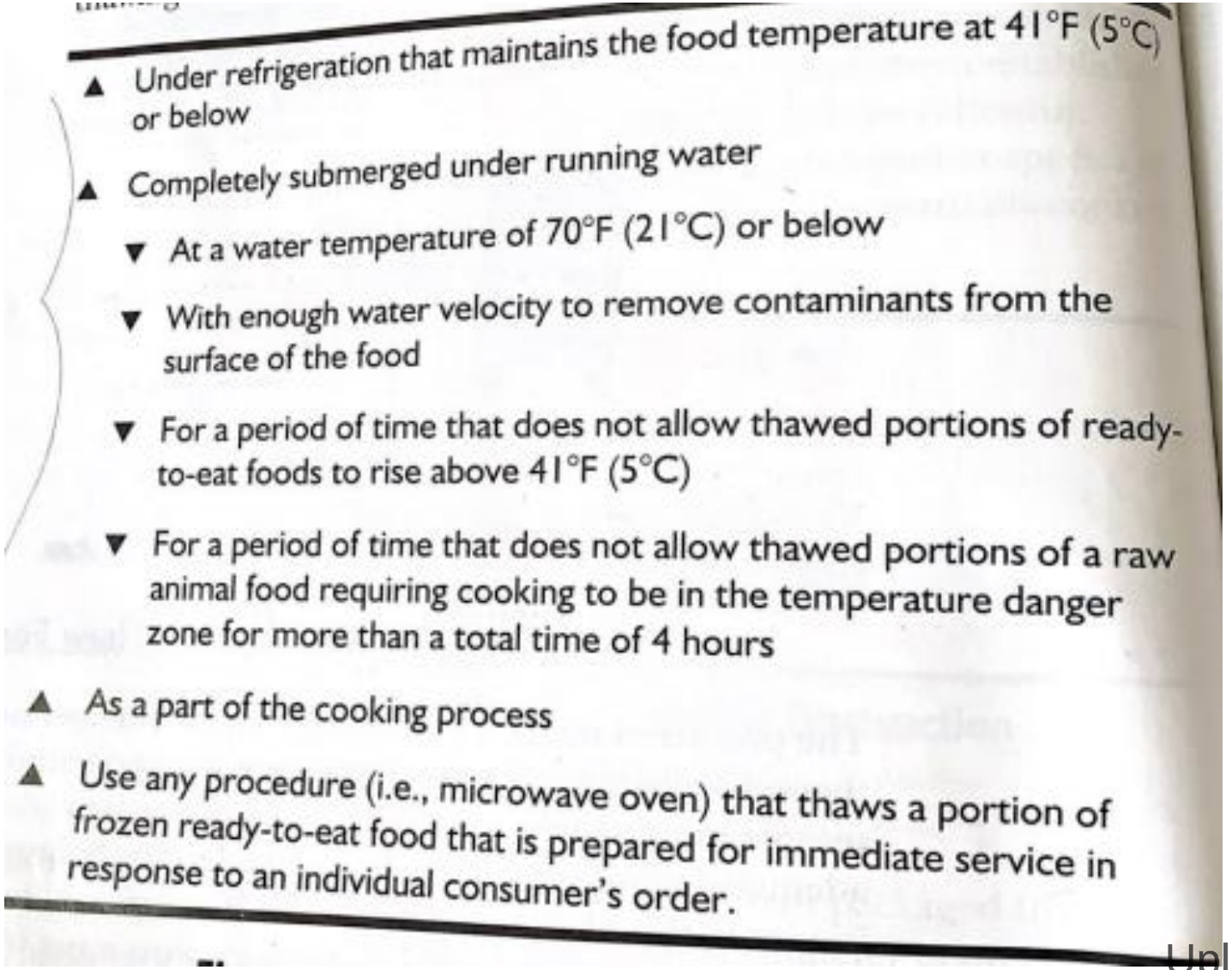
Figure 4.16 Recommended Cold Storage Guidelines
(Source: Washington State University Cooperative Extension Service)

Preparation and service

- May be more complex in large food establishments and involve many steps

- The most important technique : “the small batch” preparation
  - Limit the time the food Is in the danger zone by working with small manageable amounts of potentially hazardous foods.

Thawing



- Under refrigeration that maintains the food temperature at 41°F (5°C) or below
- Completely submerged under running water
  - At a water temperature of 70°F (21°C) or below
  - With enough water velocity to remove contaminants from the surface of the food
  - For a period of time that does not allow thawed portions of ready-to-eat foods to rise above 41°F (5°C)
  - For a period of time that does not allow thawed portions of a raw animal food requiring cooking to be in the temperature danger zone for more than a total time of 4 hours
- As a part of the cooking process
- Use any procedure (i.e., microwave oven) that thaws a portion of frozen ready-to-eat food that is prepared for immediate service in response to an individual consumer's order.

COOKING

Food Type	Minimum Internal Temperature	Minimum Time Held at Internal Temperature Before Serving
Beef Roast (rare)	130°F (54°C) 140°F (60°C)	112 min. 12 min.
Eggs, Beef and Pork (other than roasts), Fish	145°F (63°C)	15 sec.
Ground Beef, Ground Pork, and Ground Game Animals	155°F (68°C)	15 sec.
Beef Roast (medium), Pork Roast, and Ham	145°F (63°C)	4 min.
Poultry, Stuffed Meats	165°F (74°C)	15 sec.

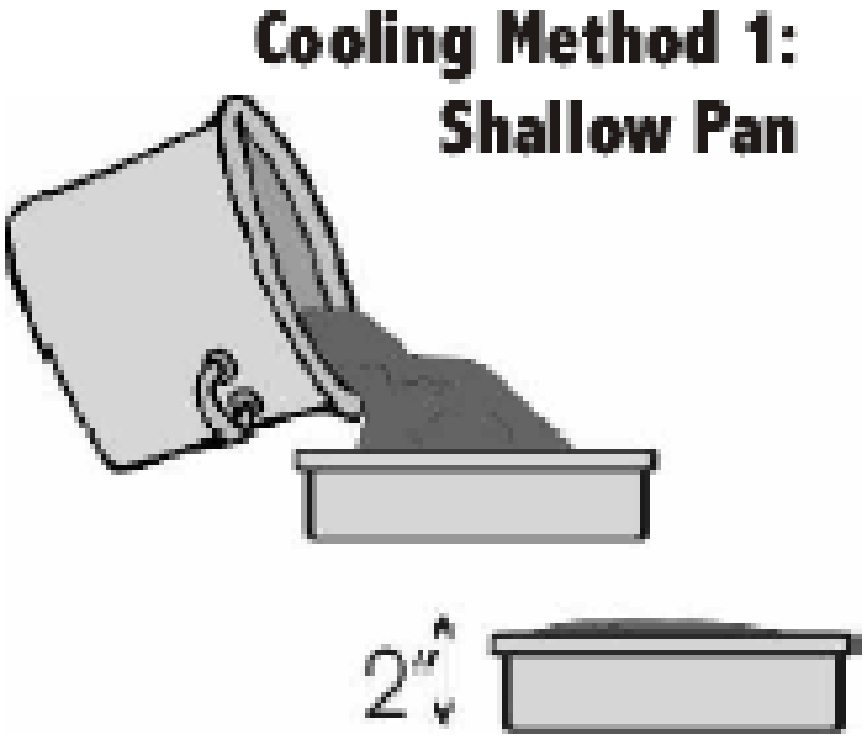
Note: When microwave cooking, heat raw animal foods to a temperature of 165°F (74°C) in all parts of the food.

TEMP. OF THE THICKEST PART OF THE FOOD

COOLING

- Use containers that facilitate heat transfer (stainless steel)
- Transfer food into shallow pans that will allow for a product depth of 3 inches or less
- Transfer food into smaller containers
- Stir food while cooling
- Place containerized food in an ice water bath
- Stir food in a container placed in an ice water bath
- Use cooling paddles to stir the food
- Add ice directly to a condensed food.

57→ 21 (2 hrs) cooling
57 → 5 (6 hrs)



SNEEZE GAURD

- Reheating : at least 74 c within 2 hours