Consumer Concerns About Foods And Water
Foodborne Illness

- Leading cause of food contamination
- Estimated 76 million people experience food borne illness annually, with 5000 deaths
- Most vulnerable are pregnant women, children, elderly, those with weakened immune system
Foodborne Infections

- Caused by eating foods contaminated by infectious microbes
- Most common – Salmonella and Campylobacter jejuni
  - enter the GI tract in contaminated foods such as undercooked poultry, eggs, meats, unpasturized milk
  - symptoms include: nausea, vomiting, diarrhea, fever
Food Intoxications

- Caused by eating foods that containing microbes that produce toxins
- Most common are staphylococcus aureus and botulism
  - staph found in meats, poultry, picnic salads, cream filled pastry
  - botulism toxin found in improperly canned foods (meats, vegetables, oils)
    - difficulty seeing, speaking, swallowing, breathing
    - death can occur within 24 hours
<table>
<thead>
<tr>
<th>Disease and Organism that Causes It</th>
<th>Most Frequent Food Sources</th>
<th>Onset and General Symptoms</th>
<th>Prevention Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Campylobacteriosis</strong> (KAM-pee-loh-BAK-ter-ee-OH-sis) <em>Campylobacter</em> bacterium</td>
<td>Raw and undercooked poultry, unpasteurized milk, contaminated water</td>
<td>Onset: 2 to 5 days. Diarrhea, vomiting, abdominal cramps, fever; sometimes bloody stools, lasts 2 to 10 days.</td>
<td>Cook foods thoroughly; use pasteurized milk; use sanitary food-handling methods.</td>
</tr>
<tr>
<td><strong>Cryptosporidiosis</strong> (KRIP-toe-spo-rid-ee-OH-sis) <em>Cryptosporidium parvum</em> parasite</td>
<td>Contaminated swimming or drinking water, even from treated sources; highly chlorine-resistant; contaminated raw produce and unpasteurized juices and cider</td>
<td>Onset: 2 to 10 days. Diarrhea, stomach cramps, upset stomach, slight fever; symptoms may come and go for weeks or months.</td>
<td>Wash all raw vegetables and fruits before peeling; use pasteurized milk and juice; do not swallow drops of water while using pools, hot tubs, ponds, lakes, rivers, or streams for recreation.</td>
</tr>
<tr>
<td><strong>Cyclosporiasis</strong> (sigh-clo-spore-EY-uh-sis) <em>Cyclospora cayetanensis</em> parasite</td>
<td>Contaminated water, contaminated fresh produce</td>
<td>Onset: 1 to 14 days. Diarrhea, loss of appetite, weight loss, stomach cramps, nausea, vomiting, fatigue; symptoms may come and go for weeks or months.</td>
<td>Use treated, boiled, or bottled water; cook foods thoroughly; peel fruits.</td>
</tr>
<tr>
<td><strong>E. coli infection</strong> <em>Escherichia coli</em> b bacterium</td>
<td>Undercooked ground beef, unpasteurized milk and juices, raw fruits and vegetables, contaminated water, and person-to-person contact</td>
<td>Onset: 1 to 8 days. Severe bloody diarrhea, abdominal cramps, vomiting; lasts 5 to 10 days.</td>
<td>Cook ground beef thoroughly; use pasteurized milk; use sanitary food-handling methods; use treated, boiled, or bottled water.</td>
</tr>
<tr>
<td><strong>Gastroenteritis</strong> c Norwalk virus</td>
<td>Person-to-person contact; raw foods, salads, sandwiches</td>
<td>Onset: 1 to 2 days. Vomiting; lasts 1 to 2 days.</td>
<td>Use sanitary food-handling methods.</td>
</tr>
<tr>
<td><strong>Giardiasis</strong> (JYE-are-DYE-ah-sis) <em>Giardia intestinalis</em> parasite</td>
<td>Contaminated water; uncooked foods</td>
<td>Onset: 7 to 14 days. Diarrhea (but occasionally constipation), abdominal pain, gas.</td>
<td>Use sanitary food-handling methods; avoid raw fruits and vegetables where parasites are endemic; dispose of sewage properly.</td>
</tr>
<tr>
<td><strong>Hepatitis</strong> (HEP-ah-TIE-tis) Hepatitis A virus</td>
<td>Undercooked or raw shellfish</td>
<td>Onset: 15 to 50 days (28 days average). Diarrhea, dark urine, fever, headache, nausea, abdominal pain, jaundice (yellowed skin and eyes from build-up of wastes); lasts 2 to 12 weeks.</td>
<td>Cook foods thoroughly.</td>
</tr>
<tr>
<td><strong>Listeriosis</strong> (lis-TER-ee-OH-sis) <em>Listeria monocytogenes</em> bacterium</td>
<td>Unpasteurized milk; fresh soft cheeses; luncheon meats, hot dogs</td>
<td>Onset: 1 to 21 days. Fever, muscle aches; nausea, vomiting, blood poisoning, complications in pregnancy, and meningitis (stiff neck, severe headache, and fever).</td>
<td>Use sanitary food-handling methods; cook foods thoroughly; use pasteurized milk.</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Onset</td>
<td>Precautions</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Perfringens</strong> (per-FRINGE-enz) food poisoning</td>
<td><em>Clostridium perfringens</em> bacterium</td>
<td>8 to 16 hours. Abdominal pain, diarrhea, nausea; lasts 1 to 2 days</td>
<td>Use sanitary food-handling methods; use pasteurized milk; cook foods thoroughly; refrigerate foods promptly and properly.</td>
</tr>
<tr>
<td><strong>Salmonellosis</strong> (sal-moh-neh-LOH-sis)</td>
<td><em>Salmonella</em> bacteria (&gt;2300 types)</td>
<td>1 to 3 days. Fever, vomiting, abdominal cramps, diarrhea; lasts 4 to 7 days; can be fatal.</td>
<td>Use sanitary food-handling methods; use pasteurized milk; cook foods thoroughly; refrigerate foods promptly and properly.</td>
</tr>
<tr>
<td><strong>Shigellosis</strong> (shi-gel-LOH-sis)</td>
<td><em>Shigella</em> bacteria (&gt;30 types)</td>
<td>1 to 2 days. Bloody diarrhea, cramps, fever; lasts 4 to 7 days.</td>
<td>Use sanitary food-handling methods; cook foods thoroughly; use proper refrigeration.</td>
</tr>
<tr>
<td><strong>Vibrio</strong> (VIB-ree-oh) infection</td>
<td><em>Vibrio vulnificus</em> bacterium</td>
<td>1 to 7 days. Diarrhea, abdominal cramps, nausea, vomiting; lasts 2 to 5 days; can be fatal.</td>
<td>Use sanitary food-handling methods; cook foods thoroughly.</td>
</tr>
<tr>
<td><strong>Yersiniosis</strong> (yer-SIN-ee-OH-sis)</td>
<td><em>Yersinia enterocolitica</em> bacterium</td>
<td>1 to 2 days. Diarrhea, vomiting, fever, abdominal pain; lasts 1 to 3 weeks.</td>
<td>Cook foods thoroughly; use pasteurized milk; use treated, boiled, or bottled water.</td>
</tr>
</tbody>
</table>

**Food Intoxications**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Onset</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Botulism</strong> (BOT-chew-lizm)</td>
<td><em>Botulinum</em> toxin produced by <em>Clostridium botulinum</em> bacterium, which grows without oxygen, in low-acid foods, and at temperatures between 40°F and 120°F; the <em>botulinum</em> (BOT-chew-lin-um) toxin responsible for botulism is called botulin (BOT-chew-lin).</td>
<td>4 to 36 hours. Nervous system symptoms, including double vision, inability to swallow, speech difficulty, and progressive paralysis of the respiratory system; often fatal; leaves prolonged symptoms in survivors.</td>
<td>Use proper canning methods for low-acid foods; refrigerate homemade garlic and herb oils; avoid commercially prepared foods with leaky seals or with bent, bulging, or broken cans. Do not give infants honey because it may contain spores of <em>Clostridium botulinum</em>, which is a common source of infection for infants.</td>
</tr>
</tbody>
</table>
Foodborne Illness

• Food Safety in the Marketplace
  – Industry Controls
  • Pasteurization- heat processing which inactivates many of the microorganisms in food. Spoilage bacteria are still present.
  • Hazard Analysis Critical Control Points (HACCP) requires food manufacturers to identify points of contamination and implement controls.
Food Safety In The Marketplace

FARMS
Workers must use safe methods of growing, harvesting, sorting, packing, and storing food to minimize contamination hazards.

PROCESSING
Processors must follow FDA guidelines concerning contamination, cleanliness, and education and training of workers and must monitor for safety at critical control points (use HACCP, see text).

TRANSPORTATION
Containers and vehicles transporting food must be clean. Cold food must be kept cold at all times.

RETAIL GROCERY-STORE AND RESTAURANT
Employees must follow the FDA’s food code on how to prevent foodborne illnesses. Establishments must pass local health inspections and train staff in sanitation.

CONSUMERS
Consumers must learn and use sound principles of food safety as taught in this chapter. Be mindful that foodborne illness is a real possibility and take steps to prevent it.
Foodborne Illness

- Food Safety in the Marketplace
  - Consumer Awareness
    - Wash hands with hot, soapy water before meals.
    - Expect clean tabletops, dinnerware, utensils, and food preparation sites.
    - Expect cooked foods to be served piping hot and salads to be fresh and cold.
    - Refrigerate carry-out foods within two hours.
Food Safety In The Kitchen

- Keep a clean, safe kitchen

- Avoid cross-contamination
  - Keep raw meat, poultry, fish separate from all other foods
  - Wash all surfaces that have come in contact with them with warm, soapy, water
  - Wash your hands with warm water and soap for at least 20 seconds before preparing or eating food
To keep a clean kitchen

- Use warm soapy water to wash hands, utensils, dishes, cutting boards, and countertops.
- Avoid cross contamination by washing all surfaces that have been in contact with raw meats, poultry, or eggs before using.
- Mix food with utensils, not hands; keep hands and utensils away from mouth, nose, hair.
- Avoid coughing or sneezing over food. A person with a skin infection or infectious disease should not prepare food.

Wash or replace sponges and towels regularly.
Clean up food spills and crumb-filled crevices.

In general

- Throw out foods with off odors.
- Do not even taste food that is suspect.
- Do not buy or use items that appear to have been opened; check safety seals, buttons, and rings. Observe expiration dates.
- Follow label instructions for storing and preparing packaged and frozen foods.
To keep hot foods hot

170°F

140°F

Use a meat thermometer to test the internal temperature of meats and poultry. Insert the thermometer between the thigh and the body of the turkey or in the thickest part of other meats, making sure the tip of the thermometer is not in contact with the bone. Cook to the temperature indicated for that particular meat; cook hamburgers to at least medium well done. Cook stuffing separately or stuff poultry just prior to cooking.

140°F

70°F

When serving foods for longer than 2 hours, maintain temperatures above 140°F. Heat leftovers thoroughly to at least 140°F.

Cook eggs and seafood thoroughly before eating them.

How to Prevent Food Poisoning: Keep Foods Hot
Food Safety In The Kitchen

- Keep hot foods hot
  - Cook hamburgers to 160 degrees

- Keep cold foods cold
To keep cold foods cold

40°F

70°F

Keep cold foods at least 40°F or less. Refrigerate leftovers promptly; use shallow containers to help foods cool faster.

0°F

10°F

Keep frozen foods at least 0°F or less.

Tote lunches in a thermal bag or box. Freeze plastic bottles or pouches of beverages and let them keep the lunch cool as they thaw out through the morning.
The voluntary “Graded by USDA” seal indicates that the product has been graded for tenderness, juiciness, and flavor. Beef is graded Prime (abundant marbling of the meat muscle), Choice (less marbling), and Select (lean). Similarly, poultry is graded A, B, and C.

The mandatory “Inspected and Passed by the USDA” seal ensures that meat and poultry products are safe, wholesome, and correctly labeled. Inspection does not guarantee that the meat is free of potentially harmful bacteria.

The USDA requires that safe handling instructions appear on all packages of meat and poultry.

Safe Handling Instructions

This product was prepared from inspected and passed meat and/or poultry. Some food products may contain bacteria that can cause illness if the product is mishandled or cooked improperly. For your protection, follow these safe handling instructions.

- Keep refrigerated or frozen. Thaw in refrigerator or microwave.
- Keep raw meat and poultry separate from other foods. Wash working surfaces (including cutting boards), utensils, and hands after touching raw meat or poultry.
- Cook thoroughly. Keep hot foods hot. Refrigerate leftovers immediately or discard.
Safe Handling Instructions

This product was prepared from inspected and passes meat and/or poultry. Some food products may contain bacteria that can cause illness if the product is mishandled or cooked improperly. For your protection, follow these safe handling instructions.

- Keep refrigerated or frozen.
- Thaw in refrigerator or microwave.
- Keep raw meat and poultry separate from other foods.
- Wash working surfaces (including cutting boards), utensils, and hands after touching raw meat or poultry.
- Cook thoroughly.
- Keep hot foods hot.
- Refrigerate leftover immediately or discard.
Recommended Safe Temperatures (Fahrenheit)

170° Well-done meats
165° Stuffing, poultry; reheat leftovers
160° Medium-done meats, raw eggs, egg dishes, pork, ground meats
145° Medium-rare beef steaks, roasts, veal, lamb
140° Hold hot foods

**DANGER ZONE:** Do not keep foods between 40°F and 140°F for more than 2 hours or for more than 1 hour when the air temperature is greater than 90°F.

40° Refrigerator temperatures
0° Freezer temperatures
Foodborne Illness

• Food Safety in the Kitchen
  – Mad Cow Disease
    • Can cause neurological damage to cows and humans
    • Ground beef and sausage are more of a concern.
    • Wild game may also be a danger
  – Avian influenza is normally found in chickens, ducks, and turkeys.
    • Possible human infection
    • May be contracted by having contact with birds, not by consuming them.
  – “Swine Flu” (H1N1) is not caused by eating pork
Foodborne Illness

• Food Safety in the Kitchen
  – Safe Handling of Seafood
    • Undercooked or raw seafood can cause problems such as hepatitis, worms, parasites, viruses and other diseases.
    • Sushi may contain raw or cooked ingredients.
    • Raw oysters may be a concern.
    • Water pollution must be controlled.
    • Processing facilities must be clean, and temperatures should be controlled.
Foodborne Illness

• Food Safety in the Kitchen
  – Other Precautions and Procedures
    • Abnormal odors with seafood – should smell fresh
    • Be mindful of safe refrigeration temperatures (≤40° F) and storage times.
  – Foods most commonly implicated in foodborne illnesses
    • Frequently unsafe
      – Raw milk and milk products
      – Raw or undercooked seafood, meat, poultry, and eggs
      – Raw sprouts and scallions
Foodborne Illness

- Occasionally unsafe
  - Soft cheeses
  - Salad bar items
  - Unwashed berries and grapes
  - Sandwiches
  - Hamburgers

- Rarely unsafe
  - Peeled fruit
  - High-sugar foods
  - Steaming-hot foods
## Safe Refrigerator Storage Times

### TABLE 19-3 Safe Refrigerator Storage Times (≤40°F)

<table>
<thead>
<tr>
<th>Time Duration</th>
<th>Items Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>One to Two Days</td>
<td>Raw ground meats, breakfast or other raw sausages, raw fish or poultry; gravies</td>
</tr>
<tr>
<td>Three to Five Days</td>
<td>Raw steaks, roasts, or chops; cooked meats, poultry, vegetables, and mixed dishes; lunchmeats (packages opened); mayonnaise salads (chicken, egg, pasta, tuna)</td>
</tr>
<tr>
<td>One Week</td>
<td>Hard-cooked eggs, bacon or hot dogs (opened packages); smoked sausages or seafood</td>
</tr>
<tr>
<td>Two to Four Weeks</td>
<td>Raw eggs (in shells); lunchmeats, bacon, or hot dogs (packages unopened); dry sausages (pepperoni, hard salami); most aged and processed cheeses (Swiss, brick)</td>
</tr>
<tr>
<td>Two Months</td>
<td>Mayonnaise (opened jar); most dry cheeses (Parmesan, Romano)</td>
</tr>
</tbody>
</table>
Prevent Food-Borne Illness While Traveling

• Traveler’s Diarrhea
  – Other countries may have lower cleanliness standards for food and water
  – Other countries have different microbes
  – 50-50 chance of catching “travelers’ diarrhea” caused by E. Coli, Shigella, Salmonella
    • Symptoms include nausea, vomiting and diarrhea
• “Boil it, cook it, peel it or forget it”
Foodborne Illness

• Food Safety While Traveling
  – How to achieve food safety while traveling
    • Wash hands. Use antiseptic wipes or hand gels.
    • Eat only well cooked and hot foods.
    • Wash fruits and vegetables in purified water and peel.
    • Use bottled water.
    • Drink only treated, boiled, canned, or bottled beverages, consumed without ice.
    • Refuse dairy products unless properly pasteurized and refrigerated.
    • Do not purchase foods or drinks from street vendors.
    • Take antimotility and antibiotic agents prescribed by a physician, if necessary.
Foodborne Illness

- Advances in Food Safety
  - Irradiation
  - Protection
    - Controlling molds in grains
    - Sterilizing spices and teas for storage at room temperature
    - Controlling insects and extending shelf life in fruits and vegetables
    - Destroying harmful bacteria in fresh and frozen beef, poultry, lamb and pork
  - Ultrahigh temperature (UHT) treatment
    - brief exposure to high temperatures
Nutritional Adequacy Of Foods And Diets

• Minimizing nutrient loss
  – Refrigerate prior to use
  – Store cut fruits and veggies in airtight containers and refrigerate
  – Wash before cutting
  – Steam or microwave
Environmental Contaminants

- Harmfulness of Environmental Contaminants
  - Depends on its persistence
  - Each level of the food chain has a greater concentration than the one below, known as bioaccumulation.
  - Heavy metals and organic halogens can enter the food supply.
1. Plants and plankton at the bottom of the food chain become contaminated with toxic chemicals, such as methylmercury (shown as red dots).

2. Contaminants become more concentrated in small fish that eat the plants and plankton.

3. Contaminants become further concentrated in larger fish that eat the small fish from the lower part of the food chain.

4. If none of the chemicals are lost along the way, people ultimately receive all of the toxic chemicals that were present in the original plants and plankton.

Key:
- Toxic chemicals

Level 1
- Several tons of producer organisms (plant and animal plankton)

Level 2
- A few tons of plankton-eating fish such as bluegill, perch, stream trout, and smelt

Level 3
- 100 pounds of fish-eating fish such as lake trout, walleye, and bass

Level 4
- A 150-pound person
Environmental Contaminants

- Harmfulness of Environmental Contaminants
  - Methylmercury
    - Can result in blindness, deafness, and lack of coordination, affects the intellect, and can cause death
    - Fish can become contaminated with methylmercury.
    - Infants born to pregnant women who consume methylmercury can be affected.
Harmfulness of Environmental Contaminants

- Methylmercury
  - Avoid shark, swordfish, king mackerel and tilefish
  - Limit other fish to 12 ounces/week
  - 6 oz white albacore tuna

- Fish high in omega-3 fatty acids and low in mercury
  - Salmon, herring, sardines, lake trout, shad, mackerel, whitefish, flounder/sole, pollock
Environmental Contaminants

- Harmfulness of Environmental Contaminants
  - PBB and PCB
    - Polybrominated biphenyl (PBB) was mixed with livestock feed in Michigan and caused nervous system problems and liver disorders in those who consumed the meat of the livestock.
    - Polychlorinated biphenyls (PCB) were found in rice oil in Taiwan and resulted in fertility problems in men and women who had children with developmental issues.
Natural Toxicants

- Poisonous Mushrooms
- Goitrogens-can enlarge the thyroid gland.
  - Found in cabbage, brussel sprouts, cauliflower, broccoli, radishes.
- Cyanogens-can produce cyanide upon activation by a specific plant enzyme.
  - Found in lima beans, fruit seeds
- Solanine-narcotic; toxic in large quantities
  - Found in the green layer under the skin of potatoes
  - Due to improper storage in light, very cold, or very warm environment
Pesticides

Hazards:
- Children, elderly and those with compromised immune function are at risk.

Regulation:
- EPA establishes tolerance level
  - Max amount of residue permitted when food used according to label.
  - Set well below level of harm
- FDA monitors foods and livestock.

Pesticides from Other Countries:
- Standards and inconsistent with U.S. standards.
Pesticides

- Consumer Concerns
  - Minimizing Risks
    - Trim fat and remove skin.
    - Select fruits and vegetables without holes.
    - Wash fresh produce with a scrub brush and rinse.
    - Use a knife to peel.
    - Discard outer leaves.
    - Peel waxed produce
    - Eat a variety of foods.
    - Consider buying certified organic foods.
**Most and Least Pesticide-Contaminated Fruits and Vegetables**

<table>
<thead>
<tr>
<th>Most Contaminated</th>
<th>Least Contaminated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peaches</td>
<td>Onions</td>
</tr>
<tr>
<td>Apples</td>
<td>Avocados</td>
</tr>
<tr>
<td>Bell peppers</td>
<td>Corn (frozen)</td>
</tr>
<tr>
<td>Celery</td>
<td>Pineapples</td>
</tr>
<tr>
<td>Nectarines</td>
<td>Mangoes</td>
</tr>
<tr>
<td>Strawberries</td>
<td>Asparagus</td>
</tr>
<tr>
<td>Cherries</td>
<td>Peas (frozen)</td>
</tr>
<tr>
<td>Kale</td>
<td>Kiwi</td>
</tr>
<tr>
<td>Lettuce</td>
<td>Cabbage</td>
</tr>
<tr>
<td>Grapes (imported)</td>
<td>Eggplant</td>
</tr>
<tr>
<td></td>
<td>Papaya</td>
</tr>
</tbody>
</table>

**NOTE:** These fruits and vegetables are ranked in order of their pesticide load.
Food Labels For Organic Products

- Foods made with 100 percent organic ingredients may claim “100% organic” and use the seal.
- Foods made with at least 95 percent organic ingredients may claim “organic” and use the seal.
- Foods made with at least 70 percent organic ingredients may list up to three of those ingredients on the front panel.
- Foods made with less than 70 percent organic ingredients may list them on the side panel, but cannot make any claims on the front.
Food Additives

- Many food additives used are preservatives.
- The FDA regulates the use of intentional additives.

Regulations Governing Additives
- The GRAS (generally recognized as safe) List
  - Additives that have been in use a long time such as salt, sugar, spices
  - Believed to be safe based on current scientific evidence
  - Ongoing review

- Delaney Clause specifies that:
  - No substance that is known to cause cancer in animals or human at any dose level shall be added to food.
Food Additives

Margin of Safety

- Zone between the concentration normally used and the amount which is hazardous.
  - Additives are permitted in foods at 100 times lower than the lowest level known to be harmful

Risk vs Benefit:

- Benefit must outweigh the risk.
- Additives cannot be used:
  - To disguise faulty products.
  - To deceive the consumer.
  - Where they destroy nutrients.
  - Where effect can be achieved via sound manufacturing process.
Intentional Food Additives

- **Antimicrobials:**
  - Salt, sugar
  - Nitrites - preserve color, enhance flavor, protect against bacterial growth including botulism

- **Antioxidants:**
  - Vitamins C & E
  - Sulfites (Salt with sulfur)
    - Destroys Thiamin
  - BHA, BHT - prevent rancidity in baked foods and snacks

- **Artificial Colors:**
  - Blue, Red, Green & Yellow

- **Carotenoids - natural coloring**
Intentional Food Additives

• Artificial Flavors
  – MSG - monosodium glutamate

• Texture and Stability:
  – Dextrin, Pectins
    – Gums-Carrageen, guar, agar
    – Yeast- thickening

• Nutrients:
  – A, D, Thiamin, Riboflavin, Niacin, Iron, Folate, Iodide
<table>
<thead>
<tr>
<th>Food Additive</th>
<th>Purpose</th>
<th>Common Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimicrobial agents</td>
<td>Prevent microorganisms from growing</td>
<td>Salt, sugar, nitrates and nitrates (such as sodium nitrate)</td>
</tr>
<tr>
<td>Antioxidants</td>
<td>Delay or prevent rancidity of fats and other damage to foods caused by oxygen</td>
<td>Vitamin C (erythorbic acid, sodium ascorbate), vitamin E (tocopherol), sulfites, BHA and BHT</td>
</tr>
<tr>
<td>Colors</td>
<td>Enhance appearance</td>
<td>Artificial: indigotine, erythrosine, tartrazine Natural: annatto (yellow), caramel (yellowish brown), carotenoids (yellowish orange), dehydrated beets (reddish brown), grape skins (red, green)</td>
</tr>
<tr>
<td>Flavors</td>
<td>Enhance taste</td>
<td>Salt, sugar, spices, artificial sweeteners, MSG</td>
</tr>
<tr>
<td>Emulsifiers and gums</td>
<td>Thicken, stabilize, or otherwise improve the consistency</td>
<td>Emulsifiers: lecithin, alginates, mono- and diglycerides Gums: agar, alginates, carrageenan, guar, locust bean, psyllium, pectin, xanthan gum, gum arabic, cellulose derivatives</td>
</tr>
<tr>
<td>Nutrients (vitamins and minerals)</td>
<td>Improve the nutritive value</td>
<td>Thiamin, niacin, riboflavin, folate, iron (in grain products); iodine (in salt); vitamins A and D (in milk); vitamin C and calcium (in fruit drinks); vitamin B&lt;sub&gt;12&lt;/sub&gt; (in vegetarian foods)</td>
</tr>
</tbody>
</table>
Indirect Food Additives

Acrylamide-
- Formed when high carbohydrate foods are cooked at high temperatures (French fries)

Microwave Packaging
- Don’t reuse
- Use glass or ceramic containers

Dioxins
- Compounds formed during chlorine treatment of wood pulp in paper making (paper plates, coffee filters)

Decaffeinated coffee
- Methylene chloride is used

Hormones
- Bovine Growth Hormone (BGH)

Antibiotics—given to livestock; residues may remain in meat and milk
Consumer Concerns about Water

- Water may contain infectious microorganisms, environmental contaminates, pesticide residues, and additives.
- The EPA monitors the safety of public water systems.
- Many consumers are choosing home water treatment systems or drinking bottled water.
Consumer Concerns about Water

- Sources of Drinking Water (potable water)
  - Surface water
    - Sources include lakes, rivers, and reservoirs.
    - Readily contaminated through acid rain, runoff from highways and urban areas, pesticide runoff from agricultural areas, and industrial wastes
    - Refreshed by fresh rain, aeration, sunlight, plants, and microorganisms
Consumer Concerns about Water

- Sources of Drinking Water
  - Ground water
    - Sources include underground aquifers.
    - Supplies rural areas and pumped by wells
    - Contaminated more slowly but more permanently
    - Especially susceptible to contamination from hazardous waste sites, dumps, landfills, underground tanks storing gasoline and other chemicals, and improperly discarded household chemicals and solvents
Consumer Concerns about Water

• Water Systems and Regulations
  – Home Water Treatments
    • Shop carefully.
    • Advantages and disadvantages
    • Determine the quality of home water first.
Consumer Concerns about Water

- Water Systems and Regulations
  - Bottled Water
    - FDA has quality and safety standards.
    - Expensive
    - Water source must be identified
    - Refrigerate after opening
    - May contain contaminants
End of Chapter 19

Consumer Concerns