NTR 306: Fundamentals of Nutrition

Chapter 19:

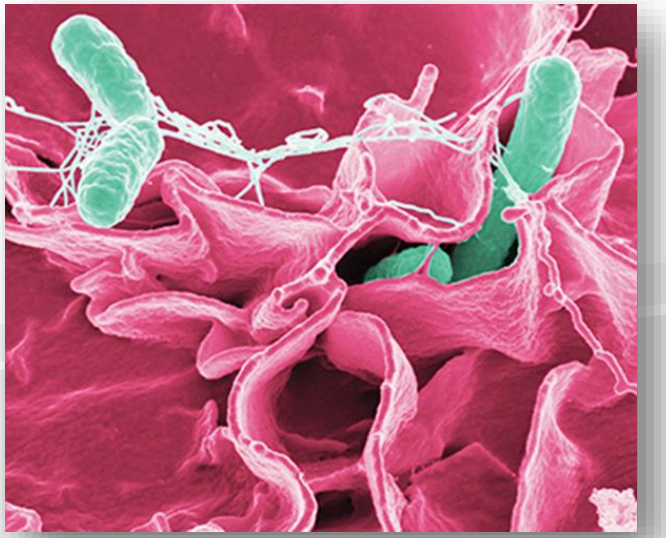
Consumer Concerns

Food Safety and Foodborne Illnesses

- Toxicity: substance can cause harm if enough is consumed
- Hazard: harm is likely under real life conditions
- Government monitoring = safety standards to protect consumers from foodborne illness outbreaks
  - Vulnerable populations: pregnant women, very young, very old, sick people, malnourished people, people with weakened immune system
  - Foodborne infections: foods contaminated by infectious microbes
    - ✓ Salmonella, listeria
  - Foodborne intoxications: foods containing natural toxins or microbes that produce toxins
    - ✓ Staphylococcus aureus, Clostridium botulinum, aflatoxins

Food Safety in the Marketplace

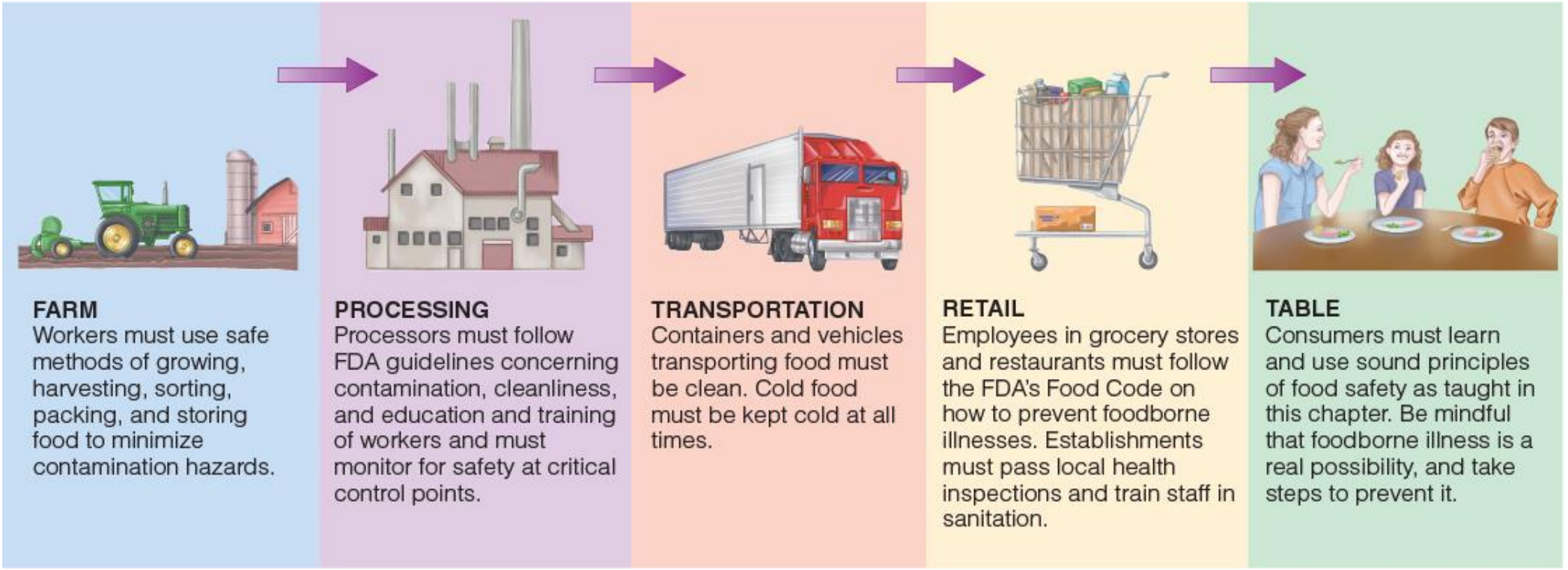
- Changes in transmission of foodborne illness
  - Commercial manufacturer errors: 80% of illnesses
  - Affects more people than in the past
- Industry controls
  - Hazard Analysis Critical Control Points (HACCP) system: prevent foodborne illness at source
  - Imported foods may have less regulatory oversight



Consumer Awareness

- State and local health regulations
  - Guidelines for cleanliness of facilities, safe preparation of food
- "Sell by," "use by," "best before," "expires on"
  - No legal definitions
  - Reflect producer recommendations for quality and freshness, not safety
  - Results in food waste
- Improper food handling can occur anywhere from manufacturer to consumer

Food Safety From Farm to Table



FARM
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.

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

RETAIL
Employees in grocery stores and restaurants must follow the FDA's Food Code on how to prevent foodborne illnesses. Establishments must pass local health inspections and train staff in sanitation.

TABLE
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.

Matching: Food Safety in the Kitchen

1. Clean
2. Separate
3. Cook
4. Chill

A. Proper internal temperature to kill microbes
B. Soap and warm water
C. Place in the fridge or freezer promptly
D. Raw eggs, meat, poultry from other food
E. Wash hands and surfaces
F. Cross-contamination

InstaPoll:

Pick the most correct statement when handling meats and poultry:

a) Ground and mechanically tenderized beef are *less* susceptible to bacterial growth.
b) All meats are equally susceptible to bacterial growth.
c) Consumers can see and detect harmful bacteria.
d) Ground and mechanically tenderized beef are *more* susceptible to bacterial growth.

Meat and Poultry Safety, Grading, and Inspection Seals

Neither inspection nor grading guarantees that the product will not cause foodborne illnesses, but consumers can help prevent foodborne illnesses by following the safe handling instructions.

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.

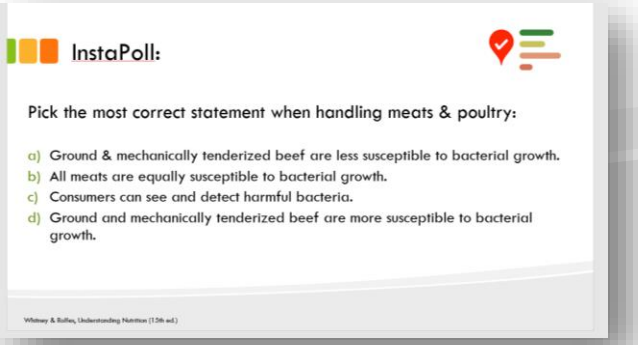
The voluntary "Graded by USDA" seal indicates that the product has been graded for tenderness, juiciness, and flavor. Beef is graded Prime (abundant marbling of the meat muscle), Choice (less marbling), or Select (lean). Similarly, poultry is graded A, B, or C.

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

Whitney & Rolfes, Understanding Nutrition (15th ed.)

Recommended Safe Temperatures

Fahrenheit Temps.



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Safe Handling of Seafood

- Illnesses associated with undercooked or raw seafood: hepatitis, worms, parasites, viral intestinal disorders, and more!
- Raw oysters: 10 bacteria species, hepatitis A
- Preventing seafood-borne illness = preventing water pollution
- "Keep it cold, keep it clean, keep it moving"
- Other food safety precautions
  - Odors
  - If you become ill…report it!

Whitney & Rolfes, Understanding Nutrition (15th ed.)

Safe Refrigerator Storage Times

TABLE 19-2 Refrigerator Home Storage (at 40°F or below)

Fresh or Uncooked Products	
Product	**Storage Times after Purchase**
Poultry	1 or 2 days
Beef, veal, pork, and lamb	3 to 5 days
Ground meat and ground poultry	1 or 2 days
Fresh variety meats (liver, tongue, brain, kidneys, heart, chitterlings)	1 or 2 days
Cured ham, cook-before-eating	5 to 7 days
Sausage from pork, beef, or turkey (uncooked)	1 or 2 days
Eggs	3 to 5 weeks

Sealed Processed Products		
Processed Product	**Unopened, after Purchase**	**After Opening**
Cooked poultry	3 to 4 days	3 to 4 days
Cooked sausage	3 to 4 days	3 to 4 days
Sausage, hard/dry, shelf-stable	6 weeks/pantry	3 weeks
Corned beef, uncooked, in pouch with pickling juices	5 to 7 days	3 to 4 days
Vacuum-packed dinners, commercial brand with USDA seal	2 weeks	3 to 4 days
Bacon	2 weeks	7 days
Hot dogs	2 weeks	1 week
Luncheon meat	2 weeks	3 to 5 days
Ham, fully cooked	7 days	slices, 3 days; whole, 7 days
Ham, canned, labeled "keep refrigerated"	9 months	3 to 4 days
Ham, canned, shelf-stable	2 years/pantry	3 to 5 days
Canned meat and poultry, shelf-stable	2 to 5 years/pantry	3 to 4 days

Whitney & Rolfes, Understanding Nutrition (15th ed.)

Environmental Contaminants

- FDA regulates presence of contaminants in foods
- Mercury poisoning
  - Fish and other seafood: trace mercury
  - Bioaccumulation: large game fish have highest amount (e.g. tilefish, shark, etc.)
  - Other toxins in fish: PCB, chlordane, dioxins, DDT
  - Most vulnerable: pregnant and lactating people, children
- EPA regulates commercial fishing
  - Farm-raised fish controversy
- Potential harm vs benefits of fish
  - Contaminants vs omega-3 fatty acids

Guidelines for Consumers

Best Choices
EAT 2 TO 3 SERVINGS A WEEK

- Anchovy
- Atlantic croaker
- Atlantic mackerel
- Black sea bass
- Butterfish
- Catfish
- Clam
- Cod
- Crab
- Crawfish
- Flounder
- Haddock
- Hake
- Herring
- Lobster, American and spiny
- Mullet
- Oyster
- Pacific chub mackerel
- Perch, freshwater and ocean
- Pickerel
- Plaice
- Pollock
- Salmon
- Sardine
- Scallop
- Shad
- Shrimp
- Skate
- Smelt
- Sole
- Squid
- Tilapia
- Trout, freshwater
- Tuna, canned light (includes skipjack)
- Whitefish
- Whiting

OR

Good Choices
EAT 1 SERVING A WEEK

- Bluefish
- Buffalofish
- Carp
- Chilean sea bass/ Patagonian toothfish
- Grouper
- Halibut
- Mahi mahi/ dolphinfish
- Monkfish
- Rockfish
- Sablefish
- Sheepshead
- Snapper
- Spanish mackerel
- Striped bass (ocean)
- Tilefish (Atlantic Ocean)
- Tuna, albacore/ white tuna, canned and fresh/frozen
- Tuna, yellowfin
- Weakfish/ seatrout
- White croaker/ Pacific croaker

Choices to Avoid
HIGHEST MERCURY LEVELS

- King mackerel
- Marlin
- Orange roughy
- Shark
- Swordfish
- Tilefish (Gulf of Mexico)
- Tuna, bigeye

* Some fish caught by family and friends, such as larger carp, catfish, trout and perch, are more likely to have fish advisories due to mercury or other contaminants. State advisories will tell you how often you can safely eat those fish.

www.FDA.gov/fishadvice
www.EPA.gov/fishadvice

EPA United States Environmental Protection Agency

FDA U.S. FOOD & DRUG ADMINISTRATION

Pesticides

- Ensure crop survival, may leave residues in the environment
- Hazards of pesticides
  - Most vulnerable: children, elderly, weakened immune system, those with direct exposure
- Regulation of pesticides:
  - EPA establishes tolerance level (well below harmful levels)
  - FDA monitors foods
- Pesticides from other countries
  - Residue limits must comply with U.S. standards
  - FAO and WHO helps set international standards

Monitoring Pesticides

- FDA: collects and analyzes domestic and imported foods
  - Seize or destroy violators
  - Individual states may also regulate and send results to FDA
- In the fields: test specific crops during production
- On the plate: "Market Basket Survey"
  - FDA buys, prepares, and analyses 6000+ foods
  - Food from over 100 countries
  - Tested to represent eight different sexes and age groups
  - Acceptable levels: "*The daily intake of a chemical, which, if ingested over a lifetime, appears to be without appreciable risk.*"

Pesticides & Human Health

- EWG (Environmental Working Group) Dirty Dozen / Clean 15 (2022)

- In reality, pesticide use poses no harm to human health
- Check out pesticide to produce ratios:

https://www.safefruitsandveggies.com/calculate/

Consumer Concerns

TABLE 19-3 Tips to Minimize Pesticide Residues and Bacteria Contamination

When Shopping for Foods

- Select fruits and vegetables that do not have holes.
- Select a variety of foods to minimize exposure to any one pesticide.
- Consider buying certified organic foods when shopping for produce most likely to be contaminated (see Table 19-4, p. 628).

When Preparing Foods

- Wash your hands for 20 seconds with warm water and soap before and after preparing foods.
- Trim the fat from meat, and remove the skin from poultry and fish; discard fats and oils in broths and pan drippings (pesticide residues concentrate in the animal's fat).
- Wash fresh produce in warm running water, gently rub soft produce or use a scrub brush on firm produce, and rinse thoroughly.
- Use a knife to peel an orange and grapefruit; do not bite into the peel.
- Discard the outer leaves of leafy vegetables such as cabbage and lettuce.
- Cut away damaged or bruised areas.
- Wash fruits and vegetables before peeling to avoid transferring dirt and bacteria from the knife onto the produce. Peel waxed fruits and vegetables; waxes don't wash off and can seal in pesticide residues.
- Peel vegetables such as carrots and fruits such as apples when possible (peeling removes dirt, bacteria, and pesticides that remain in or on the peel, but also removes fibers, vitamins, and minerals).

Organically Grown Crops

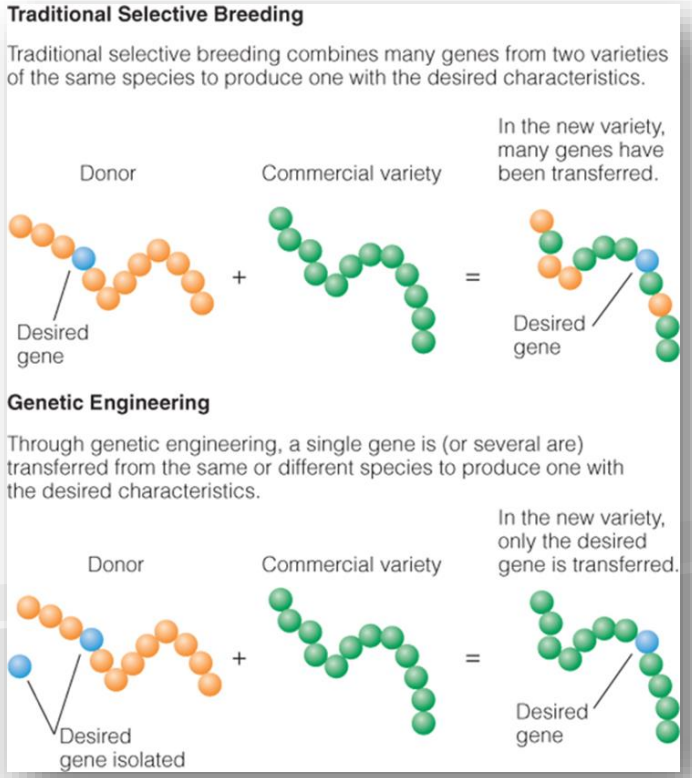
- Movement began in 1940s to return to natural farming methods to eliminate the use of chemicals (popularized in 1960s)
- Verified by a USDA-affiliated certifying agent
- Produced without:
  - Synthetic fertilizers or pesticides
  - Sewage sludge
  - Irradiation
  - Genetic engineering (GMOs)
  - Antibiotics (for the purpose of stimulating growth in livestock)

Organic Truth

- DO use pesticides
- DO use fertilizers
- Often use *more* than conventional
  - Pesticides
  - Water
  - Land
  - Resources for (transport and storage)
- Emits more greenhouse gasses
- Generally more expensive for producer and consumer
- Minimal nutritional benefits from organic foods vs conventional foods

GMOs

- What is it?
- Biotechnology: The science of manipulating biological systems or organisms to create or modify their products
- Genetic engineering:
  - Insert or modify genes to express new trait or modify existing traits
  - Faster and more precise process than selected breeding
  - Leads to: GMO (Genetically Modified Organism)
    - ✓ Most GMOs are for animal feed: soybean, alfalfa, cotton, corn
    - ✓ Humans consume:
      - sugar beets, canola, corn → in packaged foods
      - papaya, potato, squash, apple → produce



Benefits to Food Systems

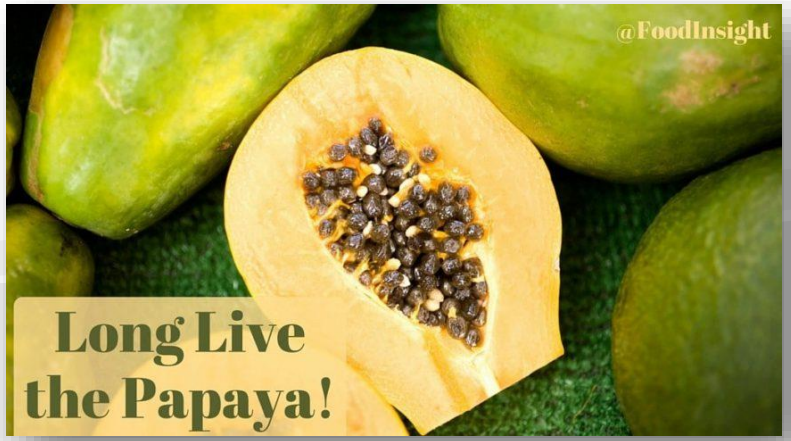

Bt cotton and cotton from an untreated control plot. Source: California Agriculture

- Reduced use of synthetic chemicals
  - Herbicides (weed killer) → "Roundup Ready" gene
    - ✓ Crops can be sprayed with Roundup and not die, but weeds will die
    - ✓ Only one type of "broad" herbicide needed (often only one application)
    - ✓ Can grow crops in marginal (weed-prone) areas
  - Pesticides (insect killer)→ Insecticidal plants
    - ✓ Plants contain Bt toxin that kills only "target pests" who eat specific crops
    - ✓ Less need for topical pesticide spray
    - ✓ More beneficial pollinators
    - ✓ Less pest damage to crops = higher market value and more available for human consumption

https://royalsociety.org/topics-policy/projects/gm-plants/which-genes-have-been-introduced-into-gm-crops-so-far-and-why/

Benefits to Food Systems

- Reduced use of synthetic chemicals
  - Fungi and viruses → Antifungal genes and virus gene insertions
    - ✓ Plant fungi and viruses destroy millions of crops (especially fruit) with no known natural resistance
    - ✓ 90% less use of fungicides: potatoes
    - ✓ Increased production due to ringspot virus resistance: papaya
  - Fertilizers → Genes for robust growth in marginal areas:
    - ✓ Especially important for climate change
      - Drought-tolerance
      - Flood-tolerance
    - ✓ Subsistence farmers in developing countries
      - More seeds per head of grain



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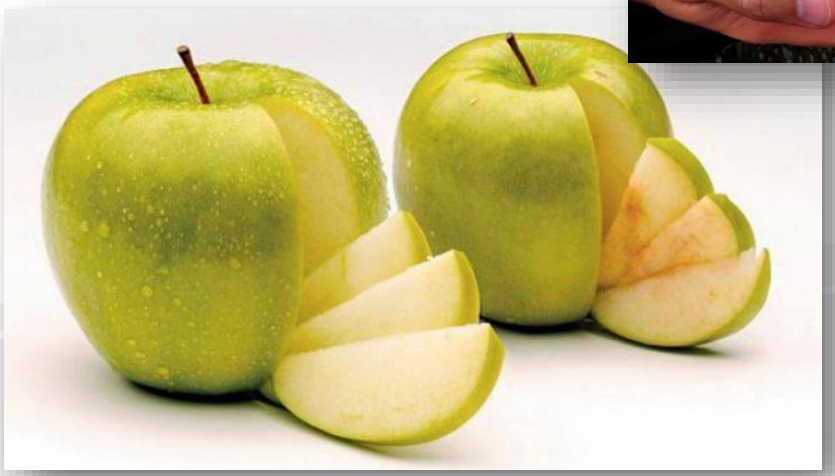
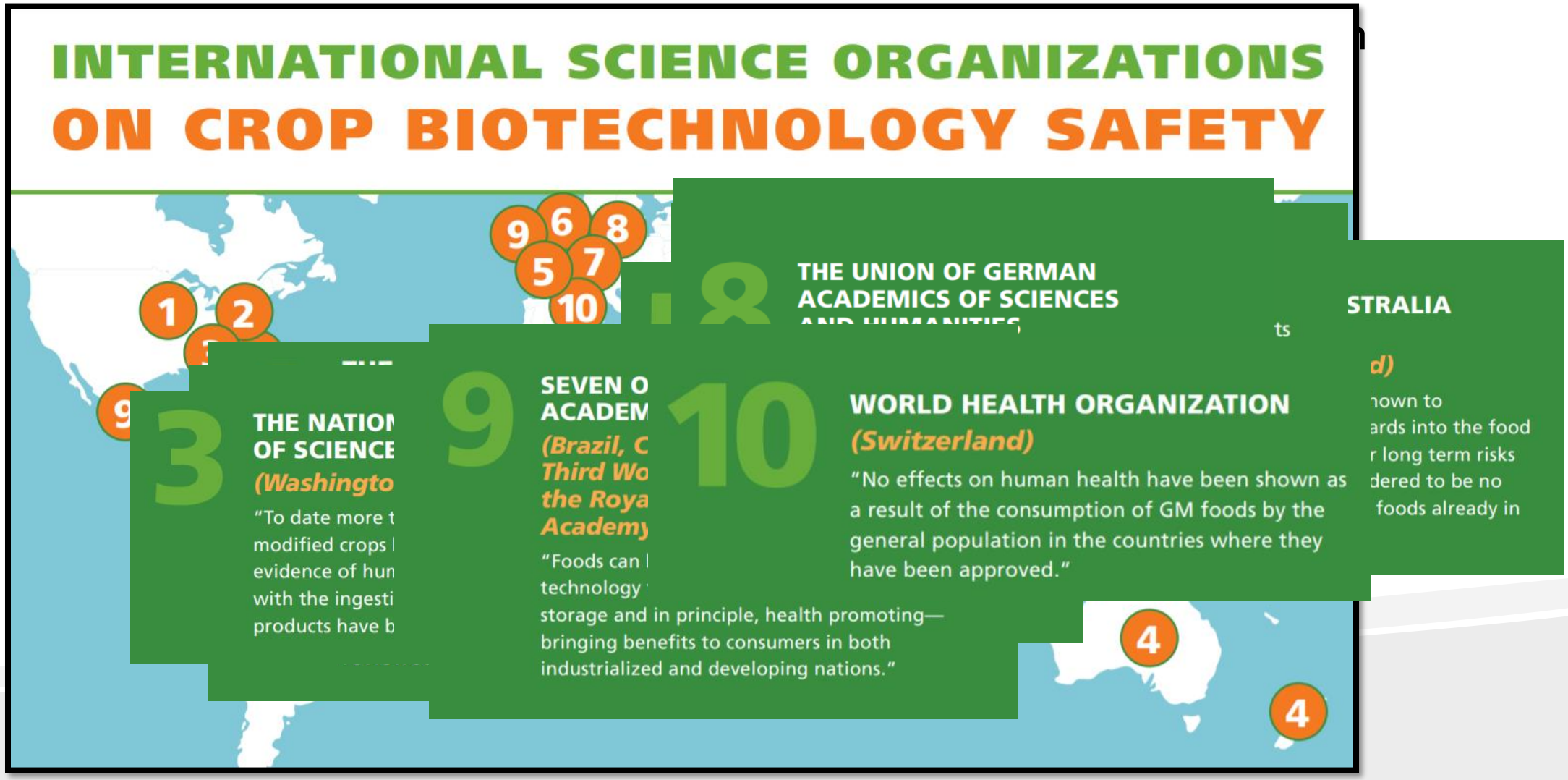
Benefits to Food Systems

- Increased nutrient content
  - Soybeans - produce healthier oil
    - ✓ Less trans fat, more monounsaturated fat
  - Golden Rice – beta carotene (Vitamin A precursor)
    - ✓ Preventing blindness and death in young children (Southeast Asia)
- Reduced food waste
  - Apples do not brown when cut
  - Pest resistance post-harvest



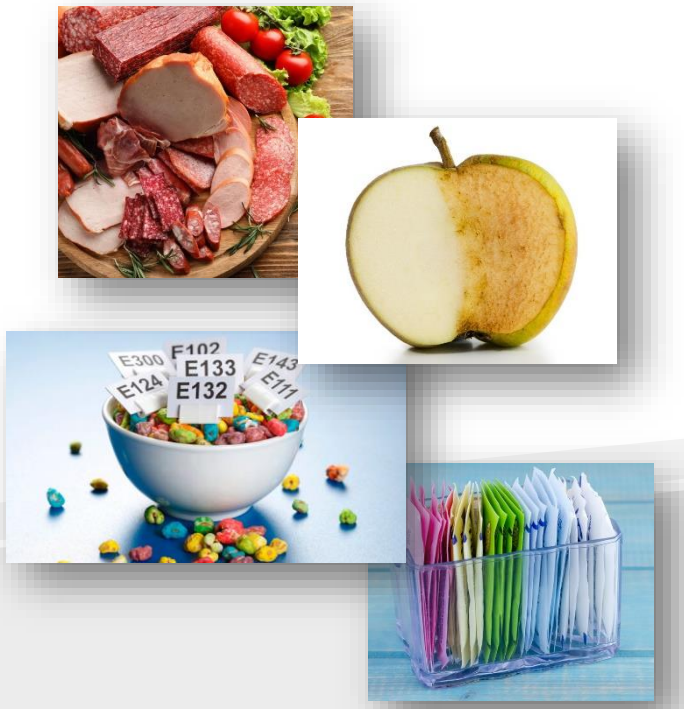
Safe for Consumption



Food Additives

- 5 types of food additives
- FDA regulation: effective; detectable and measurable in food product; safe
- Benefits > Risks

Additive	Examples	Benefit
Antimicrobial agents	Salt & Sugar ; Nitrites	Make H20 unavailable Prevent bacterial growth
Antioxidants	Vit C & E ; Sulfite ; BHA & BHT	Maintains appearance, flavor, & smell
Sensory Appeal	Spices, Herbs ; MSG ; Emulsifiers & Gums	Consumer consumption & acceptance
Nutrients	Vitamins (Bs, D, A) ; Minerals (iron & iodine)	Correct deficiencies; Restore nutrients
Nutrient-replacers	Low/No-calorie Sweeteners	Reduce added sugar



https://jamanetwork.com/journals/jama/fullarticle/2789026#:~:text=Caffeine%20in%20moderate%20doses%20(40,and%20suicide%20in%20some%20studies.

Caffeine

- 2015-2020 Dietary Guidelines
  - Strong, consistent evidence that 3-5 cups of coffee/day (≤ 400 mg/d caffeine):
    - ✓ Not associated with increased risk of major chronic diseases or cancer
    - ✓ Not associated with pre-mature death
  - Consuming 1 cup/day or less did reduce risk of (cardiovascular) mortality by 3-4%
- Potential benefits and risks →
- How much caffeine is in my…?