



Food Safety & Fresh Produce

Take Home Training
Produce Safety



At the end of this training session, participants will be able to:

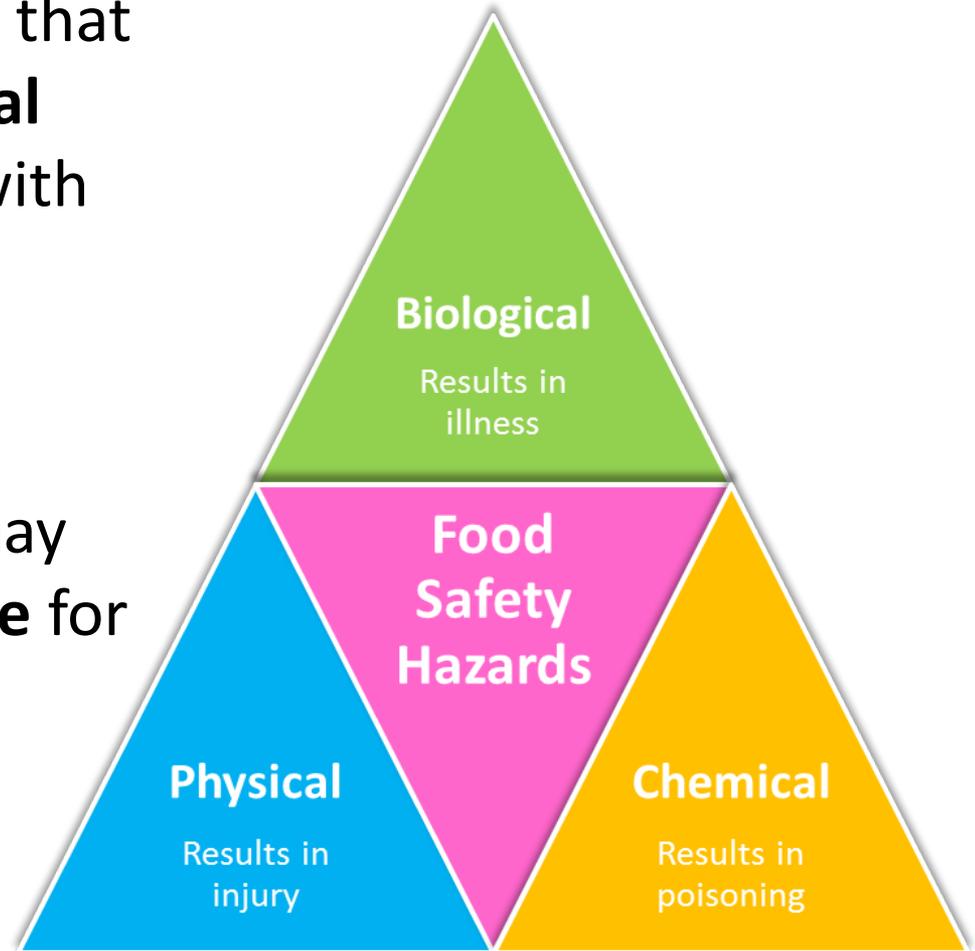
1. Understand the food safety hazards associated with fresh produce.
2. Identify which foodborne illnesses are typically associated with produce



What is Food Safety?

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- Conditions and practices that prevent the **unintentional contamination** of food with **food safety hazards**.
- A food safety hazard is a **biological, chemical, or physical** property that may cause a food to be **unsafe** for human consumption.





- **Naturally occurring**
 - Pits, shells, seeds
- **Foreign Materials**
 - Glass plastic, metal, stones, wood
 - Personal effects
- **May cause traumatic injury!**
 - Choking hazards; Damage to teeth and gums
 - Laceration and perforation of the mouth, tongue, throat, and stomach





Image Source: Puel, O.; Galtier, P.; and Oswald, I.P. Biosynthesis and Toxicological Effects of Patulin. *Toxins* 2010, 2, 613-631

- Naturally occurring
 - Mycotoxins (e.g., corn products)
 - Patulin (e.g., apple juice products)
 - Toxic mushroom species
 - Allergens
- Added
 - Environmental contaminants (e.g., pesticides, fertilizers, etc.)



- Any substance intended to control, destroy, repel, or attract a pest.
- Pests include
 - Insects
 - Rodents
 - Weeds
 - Fungi



Image Source: Texas A&M Extension

Integrated pest management is the most effective strategy for controlling pests and preventing pest damage.



Any pesticide that remains in or on a food is called a residue.



Establishes Maximum Tolerance Levels

<http://www2.epa.gov/pesticide-tolerances>



Enforces Maximum Tolerance Levels

<http://www.fda.gov/Food/FoodborneIllnessContaminants/Pesticides/ucm2006797.htm>



Monitors & Produces Data

www.ams.usda.gov/pdp





What is Organic?

Simply stated, organic produce and other ingredients are grown without the use of pesticides, synthetic fertilizers, sewage sludge, genetically modified organisms, or ionizing radiation.

The USDA offers a variety of resources on organic agriculture, including training modules, resource guides, and fact sheets.

<http://www.ams.usda.gov/services/organic-certification/is-it-an-option>

Is organic produce safer than conventional produce?

- There is no difference in the microbiological safety of organic and conventional produce.
- Data indicates that pesticide residues do not pose a food safety risk.



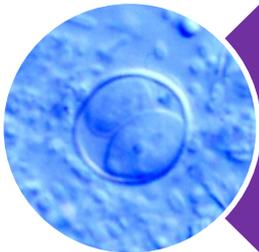
The PDP summary shows that, overall, pesticide residues found on foods tested are at levels below the tolerances set by the EPA and do not pose a risk to consumers.



Bacteria



Viruses



Parasites



Factors That Influence Microbial Growth



Image Source: Partnership for Food Safety Education

Bacteria need six conditions to grow in food.

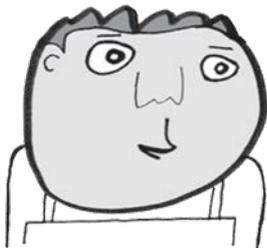
- Food
- Acidity
- Time
- Temperature
- Oxygen
- Moisture



Food: Plant Characteristics

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- Surface topography
 - Wax layers
 - Cell walls
- Physical Damage
 - Unintentional
 - Intentional



A nutritive **food** source is critical for bacterial growth.

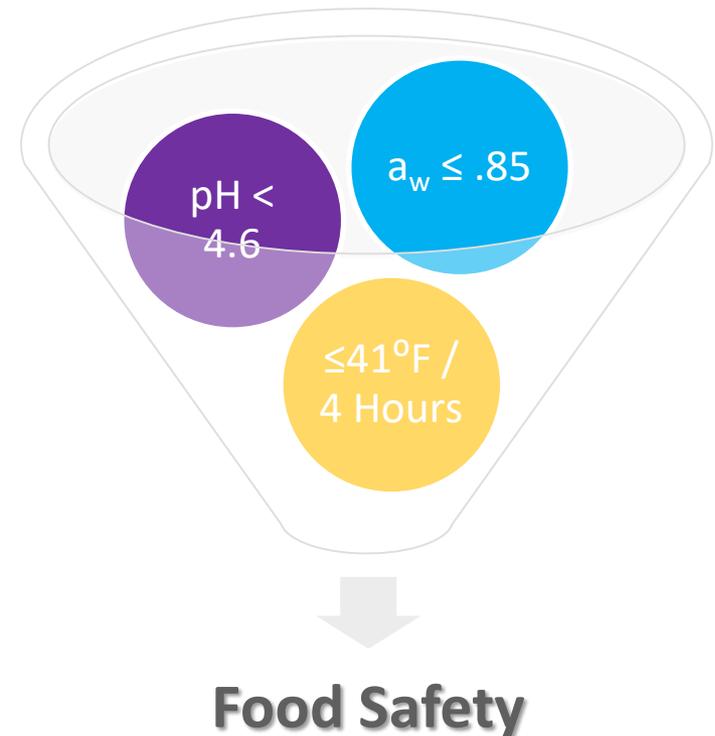
Acidity, Time, Temperature, and Moisture

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A food that requires **time** / **temperature** control to limit pathogenic microorganism growth or toxin formation is known as a TCS food.

Food is TCS based on its **acidity** (pH) and **moisture** (a_w) content.

The FDA Food Code explicitly lists **raw seed sprouts**, **cut melons**, **cut leafy greens**, and **cut tomatoes** as TCS foods.



Values presented in image are general.



Different types of bacteria need different levels of **oxygen** to grow.

- Anaerobic cells cannot tolerate oxygen
- Aerobic cells require oxygen
- Facultative anaerobes can grow with or without oxygen
 - Most foodborne pathogens are facultative anaerobes



Home-Canned Potatoes Served at Potluck Probably Caused Botulism Outbreak

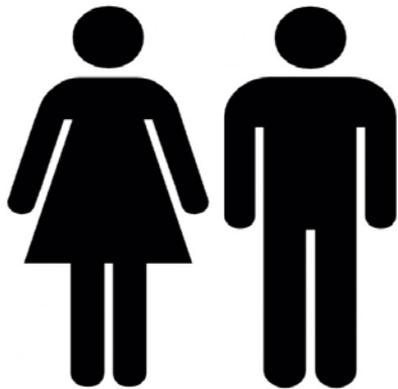


Foodborne illness

Any illness that results from eating contaminated food.



Image Source: CDC National Center for Environmental Health



Foodborne outbreak

Two or more cases of a similar illness resulting from ingestion of a common food.

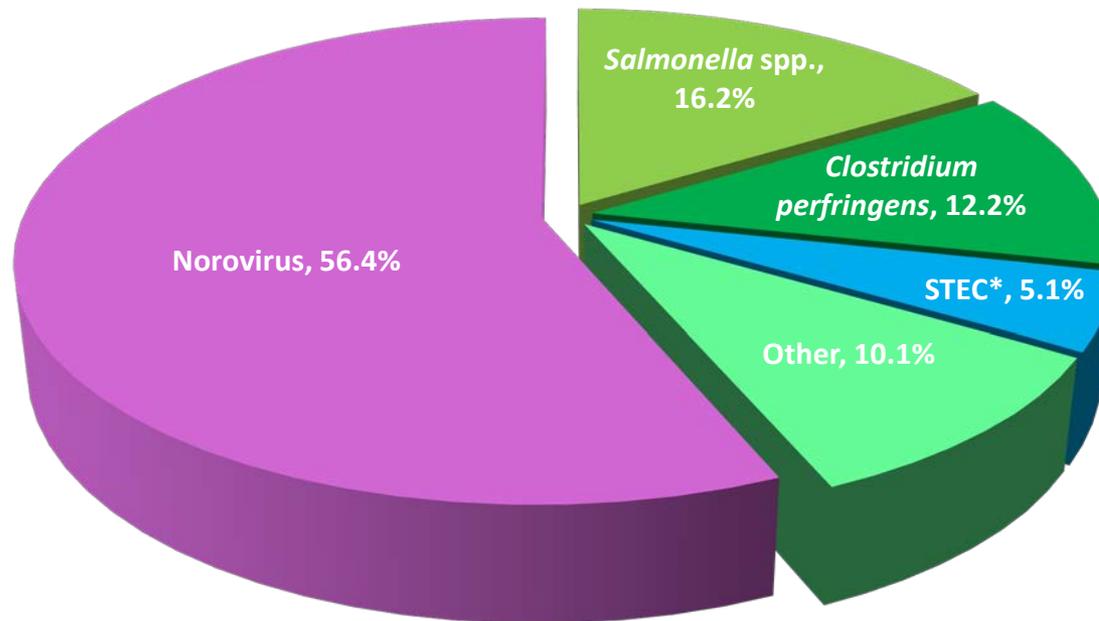


Foodborne Outbreaks in Schools

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State reported foodborne outbreaks, 2000 - 2010

Analyses includes 122 foodborne outbreaks (7,603 foodborne illnesses) in school settings



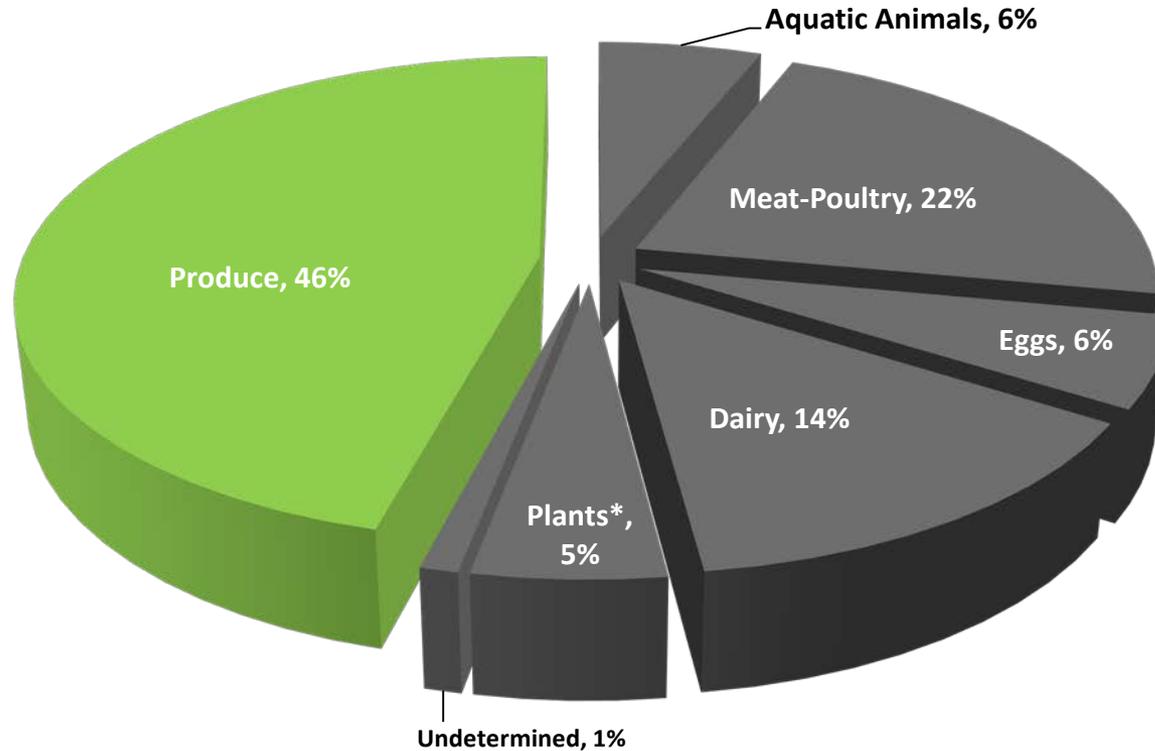
*STEC includes pathogenic and non-pathogenic Shiga-toxin producing *E. coli*

Source: Venuto, M., Garcia, K., Halbrook, B. (2015) Analyses of the Contributing Factors Associated With Foodborne Outbreaks in School Settings (2000-2010). *Journal of Environmental Health*, 77(7), 16-20.



CDC Attribution Estimates, 1998 – 2008

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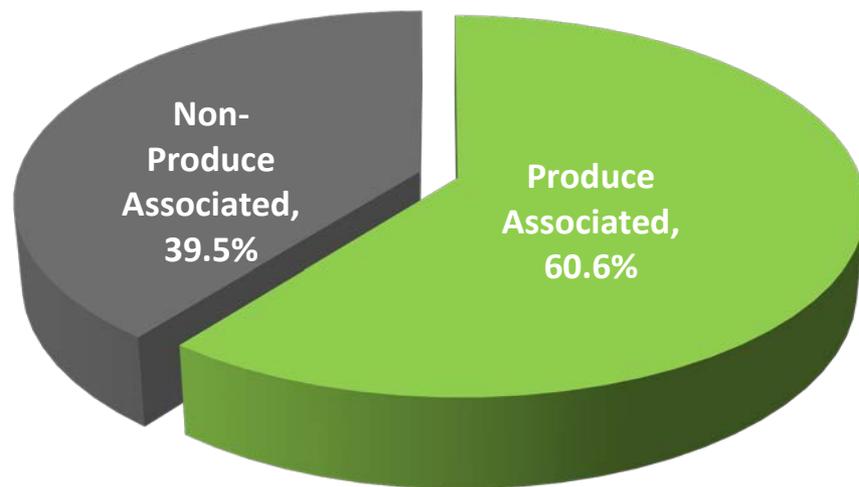
*Plants include grains-beans and oils-sugars.

Source: Painter JA, Hoekstra RM, Ayers T, Tauxe RV, Braden CR, Angulo FJ, et al. *Attribution of foodborne illnesses, hospitalizations, and deaths to food commodities by using outbreak data, United States, 1998–2008.* Emerg Infect Dis. 2013;19(3):407-15.



Estimated % of Illnesses Caused by Norovirus

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Source: Painter JA, et al. Attribution of foodborne illnesses, hospitalizations, and deaths to food commodities by using outbreak data, United States, 1998–2008. *Emerg Infect Dis* [Internet]. 2013 Mar [January 31, 2013]. <http://dx.doi.org/10.3201/eid1903.111866>

Image Source: The Institute of Child Nutrition (ICN). Employee Health and Personal Hygiene for Child Nutrition Professionals.



Preventing Outbreaks in the School

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CDC Foodborne Illness Risk Factors



- Food from Unsafe Sources
- Inadequate Cooking
- Improper Holding Temperatures
- Contaminated Equipment
- Poor Personal Hygiene

FDA Food Code Interventions



- Demonstration of Knowledge
- Implementation of Employee Health Policies
- Hands as a Vehicle of Contamination
- Time/Temperature Relationships
- Consumer Advisory



Produce safety is important...

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...and food safety hazards can be minimized.



United States Department of Agriculture