



# **Safe Plates at Farmers' Markets**

Module 1: Basics of Food Safety



# Introduction



# Case Study

## Summer 2011, Oregon

- *E. coli* O157:H7 outbreak linked to strawberries sold at multiple farm stands and farmers' markets.
  - One death
  - Four individuals hospitalized
  - 16 people ill
  - Two people suffered kidney failure
  - Outbreak traced to deer feces in field



# Case Study

## Summer 2017, Wisconsin

- *Salmonella* linked to fresh shelled peas sold at farmers' markets
  - 11 individuals ill
  - Outbreak cause not determined



# Learning Objectives

- Demonstrate how to implement a positive food safety culture
- Understand factors contributing to foodborne illness
- Identify common foodborne pathogens and diseases
- Identify causes of microorganism growth and control
- Understand importance of regulatory requirements for food safety at farmers' markets



# Key Terms

- **Food** - Anything edible that people consume including water and ice
- **Foodborne illness** - illness caused by consumption of contaminated food
- **Contamination** - presence of any harmful or objectionable substance or object (a hazard) in food
- **Pathogen** - a disease causing microorganism



# Food Safety

*What does food safety mean to you?*

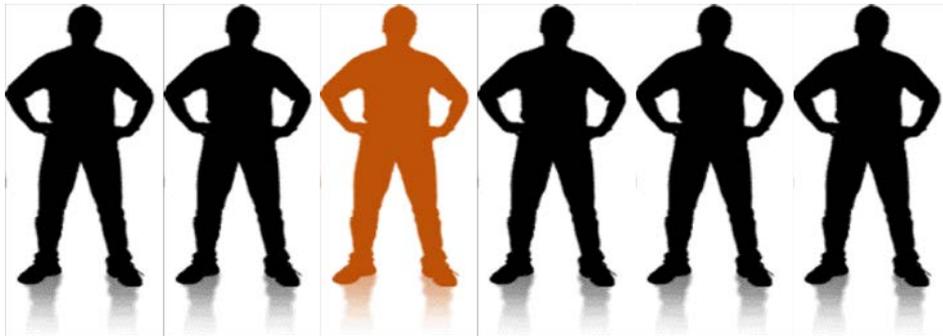
*What do you think is included in food safety?*

Food safety is the safeguarding or protection of food from anything that could harm consumers' health. It focuses on the handling, preparation and storage of food in ways that reduce the risk of foodborne illness.



# Foodborne Illness

- Foodborne illness sickens approximately 1 in 6 people in the United States every year
  - 48 million illnesses
  - 128,000 hospitalizations
  - 3,000 deaths
  - Estimated annual cost \$51-77.7 billion



# Top Five Foodborne Pathogens CDC 2011 Estimate

PATHOGEN	NUMBER OF CASES	% OF TOTAL ILLNESSES
Norovirus	5,461,700	58%
<i>Salmonella</i>	1,027,500	11%
<i>Clostridium perfringens</i>	965,900	10%
<i>Campylobacter</i>	845,000	9%
<i>Staphylococcus aureus</i>	241,100	3%



# The Big Five Factors

Centers for Disease Control and Prevention (CDC) identified the most common factors for foodborne illness as being:

1. Food purchased from unsafe sources
2. Failure to cook food to correct temperature
3. Improper holding temperatures
4. Contaminated equipment
5. Poor personal hygiene



# Populations at Increased Risk

- People who are more likely than the general population to experience foodborne diseases
  - **Y**oung (preschool age and younger)
  - **O**ld (elderly)
  - **P**regnant women and unborn babies
  - **I**mmune compromised (weakened immune systems)





# Food Safety Culture



# Case Study

## November 2012, Michigan

- *E. coli* O157:H7 linked to apple cider sold at a local farmers' market.
  - Four individuals hospitalized, including two children
  - Prison sentence of 14 - 48 months for owner



***What do you think of the food safety culture at this farm?***

# Food Safety Culture

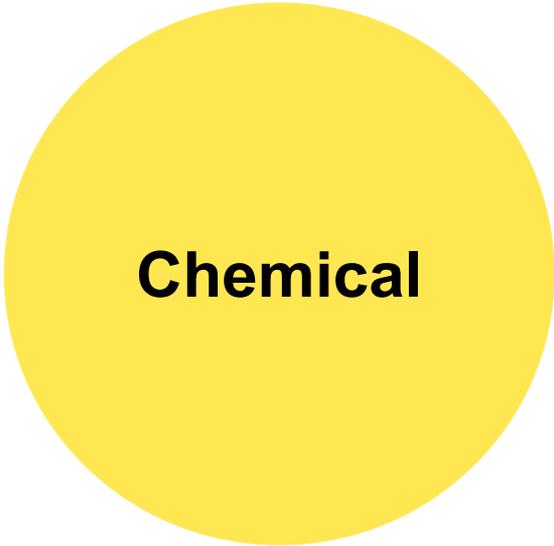
- Built on shared values that are followed to produce and provide food in a safe manner
- To maintain a good food safety culture:
  - Know the risks associated with products
  - Understand the importance of managing the risks
  - Effectively manage potential risks
  - Support evidence-based food handling behaviors



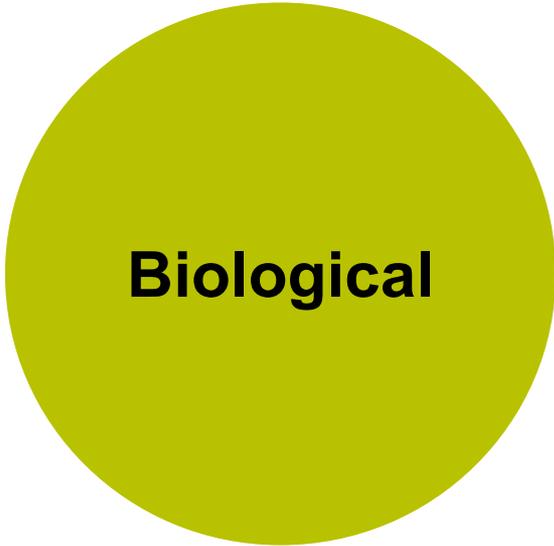


## Hazards in Food

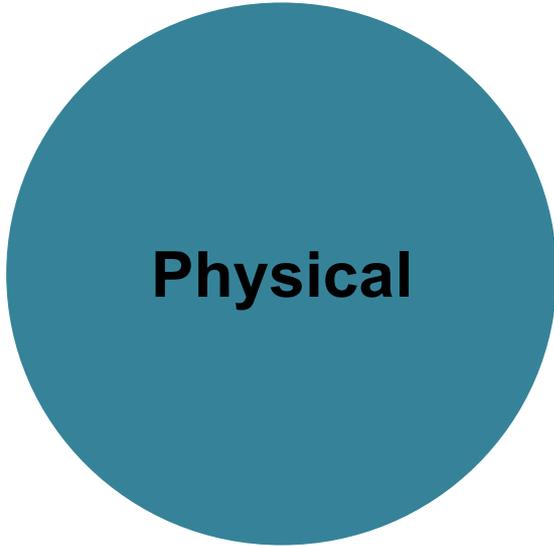
# Potential Hazards in Food



**Chemical**



**Biological**



**Physical**

*What potential hazards could be in your products?*

# Food Safety Hazards: Physical

- Object or foreign matter in a food item
- May cause illness or injury to a person consuming the product
- Sources
  - Raw materials
  - Poorly maintained facilities and equipment
  - Improper production procedures
  - Poor employee practices



# Food Safety Hazards: Physical

- Examples
  - Metal, glass, plastic
  - Rock, wood
  - Bone, shell, feather
  - Insect
- Control by following pre-requisite programs



# Food Safety Hazards: Chemical

- Toxic substances in a food item
- Ingestion causes a health concern
- Examples
  - Allergens (Big 8)
  - Pesticides
  - Cleaners and sanitizers
  - Additives
  - Chemical leaching
  - Fertilizers



# Common Food Allergens



Milk



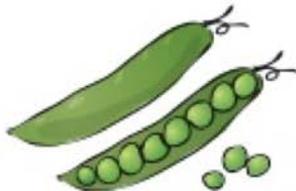
Eggs



Peanut



Tree Nuts



Soy



Wheat



Fish



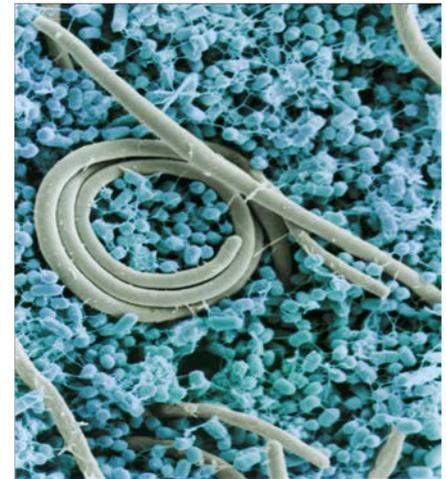
Shellfish

# Food Safety Hazards: Biological

- Microorganisms that cause illness are:
  - Bacteria
  - Fungi (molds, yeasts)
  - Viruses
  - Parasites
- Most microorganisms are helpful, many are necessary for our health and production of foods.

# Food Safety Hazards: Biological

- Bacteria
  - Single celled, living microorganisms
  - Grows in food
  - Replicates quickly under right conditions
- Examples: *Salmonella*, *Listeria*, *Clostridium perfringens*, *Campylobacter jejuni*, *E.Coli* O157:H7, *Staphylococcus aureus*



# Food Safety Hazards: Biological

- Fungi
  - More of a spoilage concern than a foodborne illness concern
  - Examples: *Aspergillus*, *Rhizopus* and *Penicillium*
- Viruses
  - Requires a host to grow and reproduce (human/animal)
  - Can persist for weeks on surfaces
  - Examples: Hepatitis A virus, Norovirus and Rotavirus



# Food Safety Hazards: Biological

- Parasites
  - Parasites can be associated with contaminated food and water, especially produce irrigated with contaminated water
  - Examples: *Cryptosporidium*, *Giardia*, *Toxoplasma gondii*, *Trichina spiralis*





# Growth Factors

# Microorganism Growth and Control

- The factors that influence microorganism growth and control:
- Food, Acidity, Temperature, Time, Oxygen, Moisture

**F**

food



**A**

acidity



**T**

temperature



**T**

time



**O**

oxygen



**M**

moisture



# Food

- Microorganisms need an energy source to grow
- Microorganisms use our food as their energy source



# Acidity

- Acidity is the amount of acid present.
- Pathogens grow at a faster at a pH between 4.6 (slightly acidic) and 7.5 (neutral).
- Most foods are neutral to slightly acidic.

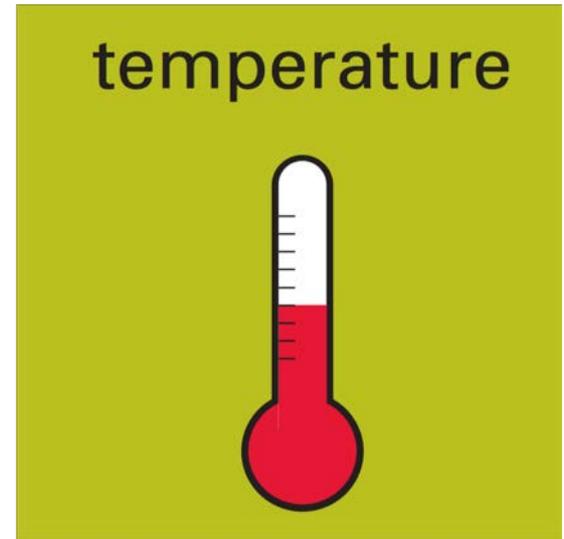


# Acidity

FOOD PRODUCT	Approximate pH
Lemons	2
Vinegar	3
Tomatoes	4
Potatoes	6
Water	7
Eggs	8
Bleach	12

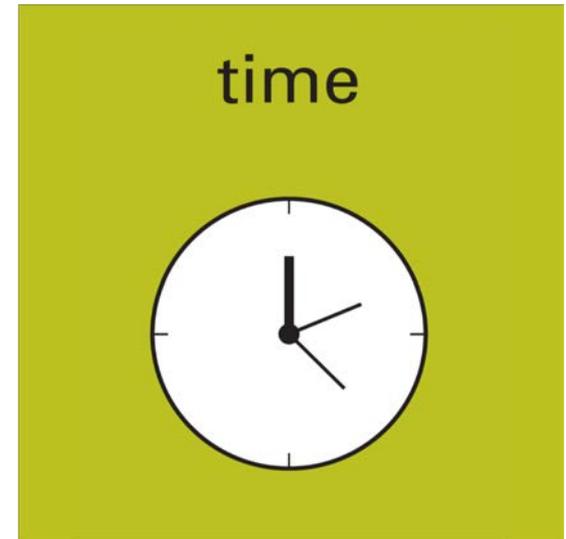
# Temperature

- Microorganisms grow faster in warm conditions.
- At 41°F or below, pathogens grow more slowly or stop growing at all.
- At 135°F or above, pathogens begin to die.



# Time

- Growth and control of microorganisms is directly related to influencing factors for a period of time.
- **Time/Temperature Control for Safety (TCS)** - foods that require control of time and temperature to reduce growth of pathogenic microorganism growth and/or toxins.



# Examples of TCS Foods

- Animal Products
  - Raw and cooked meat and poultry
  - Foods made from meat or poultry stocks
  - Milk and dairy products
  - Raw shell eggs or products containing them
  - Raw or cooked fish and shellfish
- Produce and Grains
  - Cooked vegetables, beans, pasta, rice and potatoes
  - Cut tomatoes
  - Cut melons
  - Cut leafy greens
  - Raw seed sprouts
  - Unacidified garlic and oil mixtures



# Example: Cantaloupe

Whole cantaloupe IS NOT a TCS food, but cut cantaloupe IS.

*Why do you think this is?*



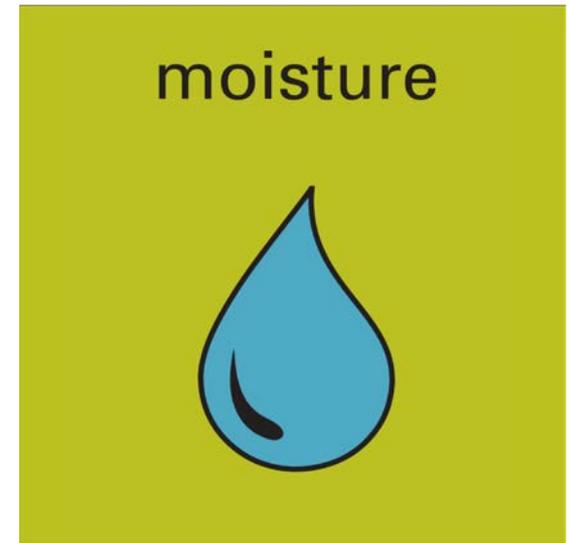
# Oxygen

- Microorganisms have different oxygen needs for optimum growth.
  - Most need oxygen to grow
  - Some only grow without oxygen
  - Some can grown with or without oxygen



# Moisture

- Measurement of water in food is called water activity ( $a_w$ ) and is measured from 0 to 1.00.
- Water activity is not equal to moisture content.
- Pathogenic bacteria usually need an  $a_w$  of 0.85 to grow.



# Example $a_w$

FOOD PRODUCT	WATER ACTIVITY $a_w$
Fresh meats, fruits, vegetables	0.95-0.97
Soft/semi-soft cheeses, cured meat, bakery goods, evaporated milk	0.90-0.94
Sweetened condensed milk, aged cheddar cheese, salami, jerky	0.83-0.88
Jams, marmalade, dried figs	0.71-0.79
Cookies, crackers, whole milk powder, corn flakes, dehydrated soups	0.30

# Ready-to-Eat Foods (RTE)

- RTE foods that can be consumed without preparation or treatment, such as washing or cooking, immediately before they are eaten.
  - Raw washed fruits and vegetables
  - Prepared salad vegetables
  - Deli items
    - Ex: cheese, cold meats, fermented meats, hot dogs
  - Baked goods
  - Nuts
  - Spices





# Regulatory Considerations

# Legal Requirements

- Know requirements on food production, processing and sales
- Know food safety precautions:
  - Labeling
  - Certifications
  - Classes such as as GAPS, Acidified Foods School

*Who regulates samples at a farmers' market?*

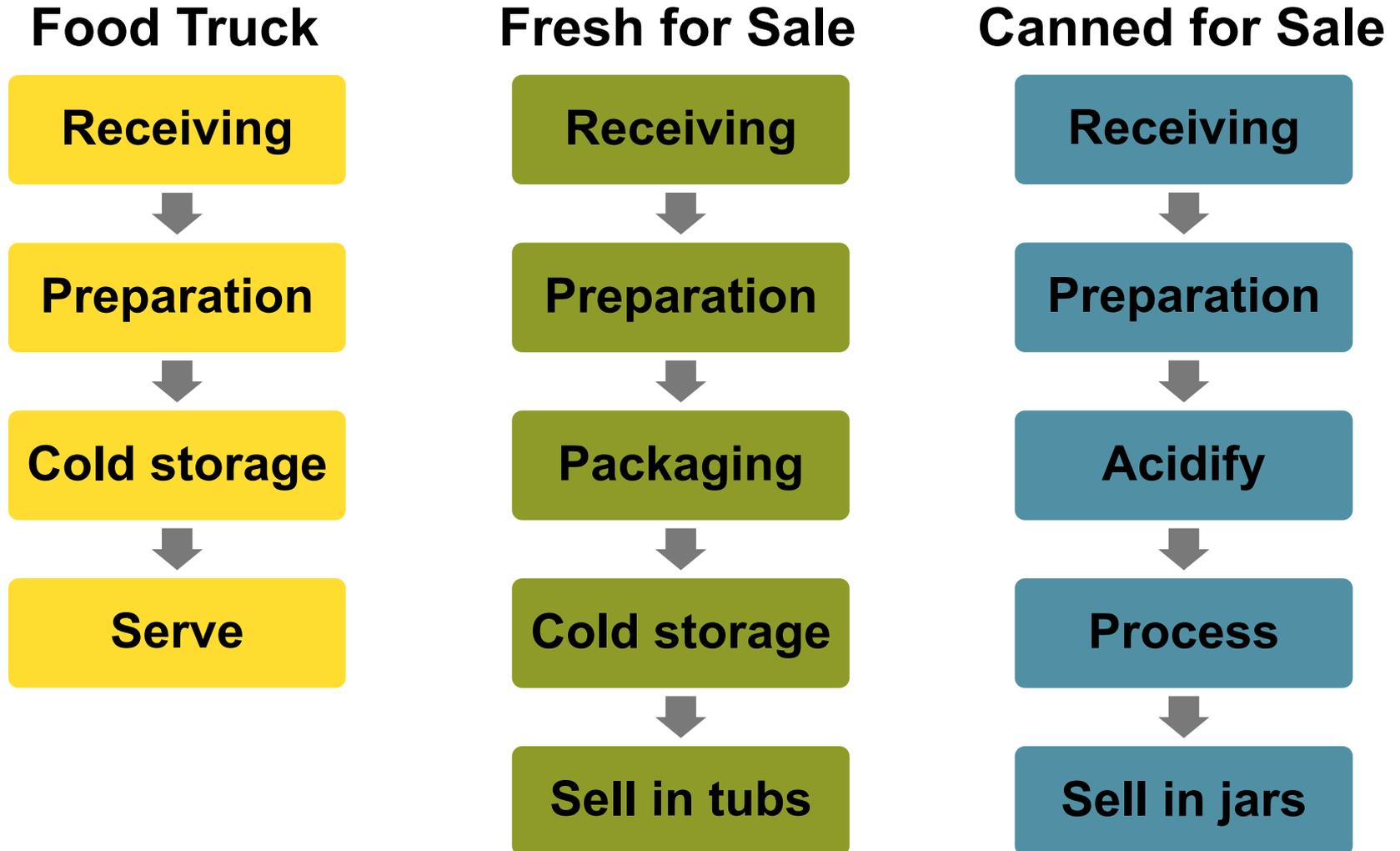


# Case Study

- Producing salsa
- Ingredients
  - Tomatoes
  - Onions
  - Peppers
  - Lime juice
  - Cilantro
  - Salt and pepper



# Salsa Scenarios



# Salsa Scenarios: Food Truck

## Food Truck

Receiving



Preparation



Cold storage



Serve

- Inspected by North Carolina Department of Health and Human Services (NCDHHS)
- Other regulator considerations:
  - NC Food Code
  - Cold storage temperature
  - TCS food

# Salsa Scenarios: Fresh for Sale

## Fresh for Sale

Receiving



Preparation



Packaging



Cold storage

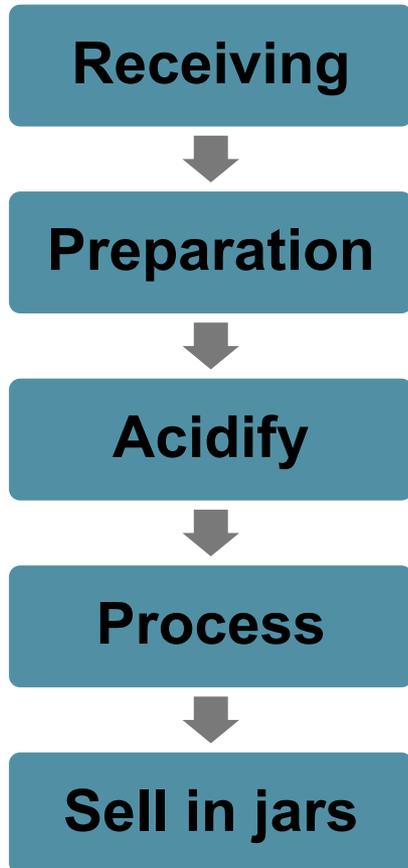


Sell in tubs

- Regulated by the North Carolina Department of Agriculture and Consumer Services (NCDA &CS)
- Other regulatory considerations:
  - Good Manufacturing Practices (GMPs) outline in 21 Code of Federal Regulations (CFR) Part 110
  - Preventative Controls for Food
  - Preventative Controls Qualified Individual (PCQI)

# Salsa Scenarios: Canned for Sale

## Canned for Sale



- Regulated by the North Carolina Department of Agriculture and Consumer Services (NCDA & CS)
- Other regulatory considerations:
  - Acidified food, 21 CFR 114
  - Product evaluation
  - Better Process Control School

# Acidified Foods

- A food, usually a vegetable, preserved by an acid, so that the pH is at or below 4.6.
- Most acidified foods sold at farmers market fall under this FDA regulation, outlined in CFR 21 Part 114.
- Required to complete [Better Process Control School](#)
  - Intended for certified supervisor responsible for assuring use of adequate pH, time, and temperature  
Learn the process for producing safe products
  - Offered 2+ times per year in  
NC State University



# NCDA & CS

- Regulates the following if not shipped over state lines:
  - Packaged food other than meat products
    - Ex. Jams and jellies
  - Seafood
  - Dairy products, including milk, frozen dessert, cheese and butter
  - Eggs
  - Raw agricultural commodities
  - Meat and meat-containing products through the Meat and Poultry Inspection Service



# Review

- Food safety culture
- Factors responsible for foodborne illness outbreaks
- Causes of microorganism growth and control
- Regulatory considerations