# Understanding Microorganisms on the farm that can cause illness

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**UC ANR Southern California Urban Agriculture Workshop #4**
**Food Safety Basics**

August 11, 2017

USDA United States Department of Agriculture National Institute of Food and Agriculture

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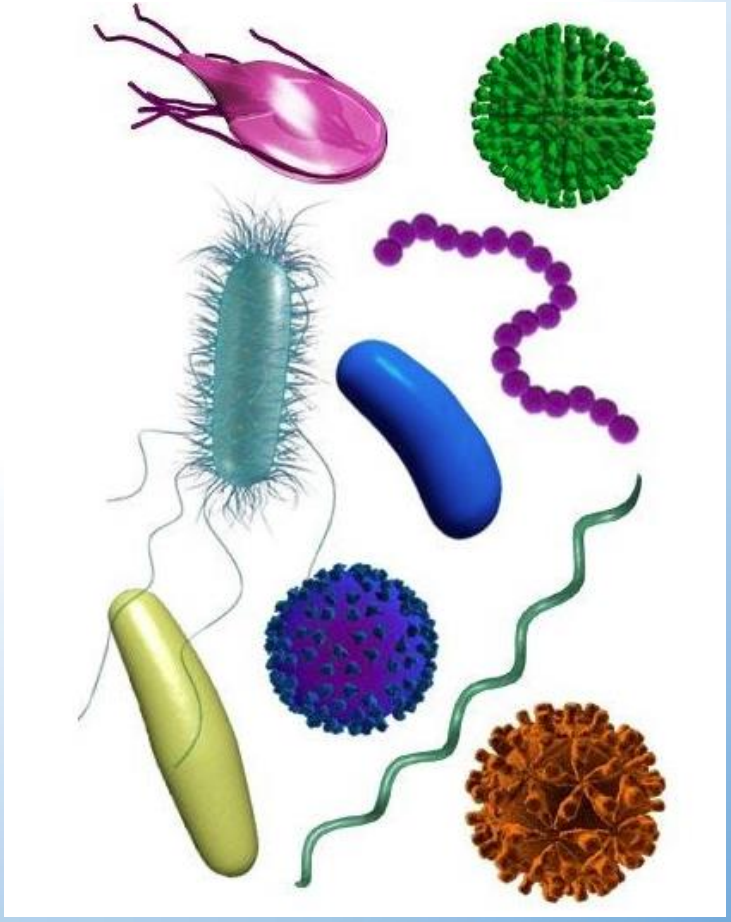
Produce Safety ALLIANCE

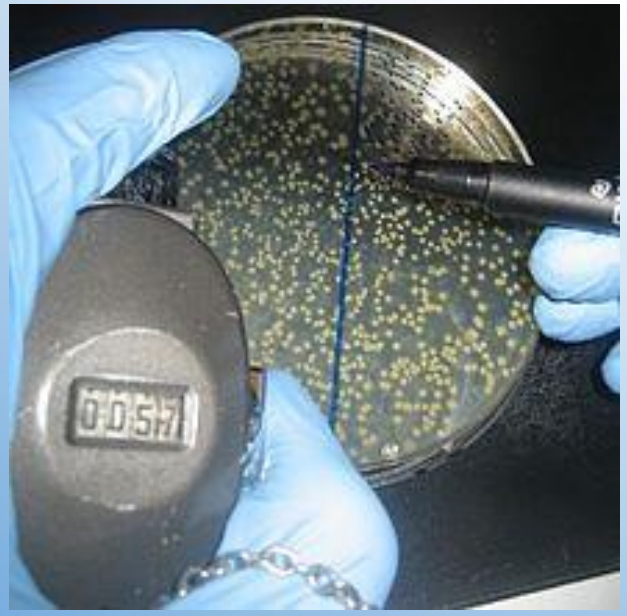
# Foodborne pathogens are microorganisms

- Transmitted by food and causes people to become sick.
- **Microorganisms** Bacteria, molds, viruses, parasites and other organisms so small they cannot be seen without the aid of a microscope.
- Also known as microbes.



# Microbial Food Safety Terms

- **CFU (Colony Forming Unit)**
  A cell or cluster of cells capable of multiplying for form a colony of cells. Expresses the concentration of microorganisms. (FSMA Produce Safety Rule).



# Microbial Food Safety Terms

- **Enteric pathogens**
  Disease-causing microorganisms that originate in the intestines of humans or animals.

- **Fecal coliform bacteria**
  Microorganisms associated with the intestines of warm-blooded animals. Water tests commonly used to indicate presence of fecal material and potential presence of organisms capable of causing disease in humans.

# Microbial Food Safety Terms

- **Good Agricultural Practices (GAPs)**
  Any agricultural management practice or operational procedure that reduces microbial risks or prevents contamination of fruits and vegetables on the farm or in the packing house.

- **Good Management Practices (GMPs)**
  Standards published in the Code of Federal Regulations (Title 21) and used by the Food and Drug Administration to ensure quality of marketed products and that products are produced under sanitary conditions.

# Microbial Food Safety Terms

- **HACCP**
  **(Hazard Analysis Critical Control Point system)**
  A multi-faceted system comprised of a hazard analysis that identifies the dangers that exist in storing, preparing and selling foods and establishment of critical control points which are steps or procedures where control can be applied and food safety hazards can be prevented, eliminated or reduced to acceptable levels.

# Viruses

# Noroviruses

- Leading cause of illness in U.S., from contaminated food or water, and contaminated surfaces.
- Spreads easily from person to person and spreads quickly in groups of people.
- Fruits, vegetables, meats, salads prepared or handled by an infected person. (Oysters grown in contaminated water).

# Noroviruses


# Noroviruses Routes of Entry

1. Ready-to-eat (RTE) food contaminated by food workers.
2. Environmental contamination of produce.
3. Consumption of molluscan shellfish harvested from contaminated water.

   In each of these classes, transmission occurs through fecal-oral route (or vomit), and often **associated with improper sanitation controls or their application**.

# Pathogenic Bacteria

# Toxin-forming species of *Escherichia coli*

## *E. coli* O157:H7

# Shiga toxin-producing *E. coli*

- Most *E. coli* bacteria are harmless.
- Some produce a toxin (Shiga toxin) that can cause serious illness, bloody diarrhea, blood-clotting, kidney failure, and death.
- "Shiga toxin-producing" *E. coli*, or STEC for short.
- ***E. coli* O157:H7**

# (STEC) *E. coli* Routes of Entry

- **Route of entry:** Oral (ingestion of contaminated food, water, or fecal particles).
- **Sources:** Raw or undercooked ground beef; **various water sources**, including potable, well, and recreational water; contact with animals at farms.
- Produce, including bagged lettuce, spinach, and alfalfa sprouts, increasingly is being implicated in O157:H7 infections.
- Person-to-person transmission of infections is well documented.

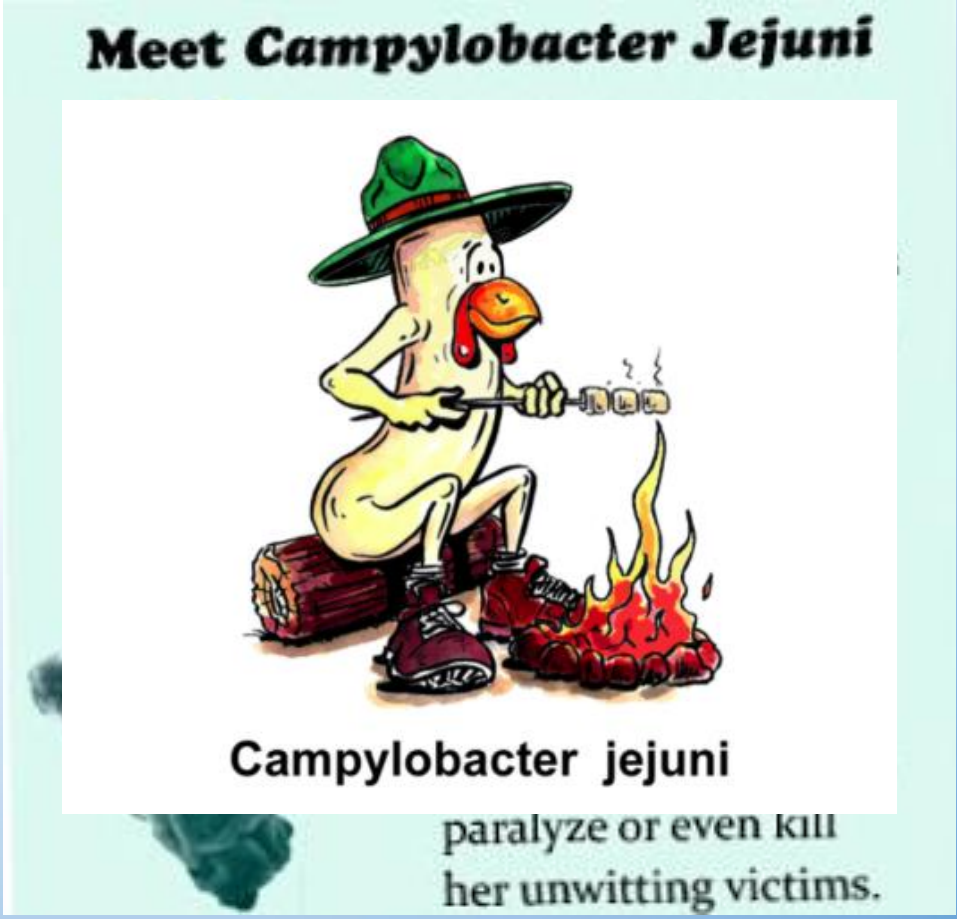
# (STEC) *E. coli* Prevention (CDC)

- Wash Your Hands thoroughly after using bathroom or changing diapers and before preparing and eating food.
- **Wash Your Hands after contact with animals or their environments (farms, petting zoos, fairs, ”even your own backyard”).**
- Cook meats thoroughly.
- **Prevent cross-contamination in food preparation areas** by thoroughly washing hands, counters, cutting boards, and utensils after they touch raw meat.

Visit CDC for full details:
https://www.cdc.gov/ecoli/general/index.html

# *Campylobacter jejuni*

- Third leading bacterial cause of foodborne illness in the U.S.
- **Part of natural gut microflora of most food-producing animals, poultry (chickens) most relevant to urban farms.**



# *C. jejuni* Sources

- **Route of entry:** Oral.
- Potential reservoirs include poultry, wild birds, rabbits, rodents, and domestic pets.
- As a fecal organism, present in sewage and untreated waters.
- Soil, through which *C. jejuni* – contaminated water has passed, can also contain the organism.
- Produce irrigated or washed with *C. jejuni* - contaminated water will allow organism entry into the food chain.

# Steps to avoid *C. jejuni*

- As with all bacteria that cause foodborne illness!
- Clean raw vegetables and fruits, surfaces, utensils, and wash your hands.
- **Minimize/prevent contact between poultry, pets, and wildlife and food crops.**
- Separate raw foods from cooked foods, surfaces, utensils, dinnerware, etc.
- Cook raw poultry according to instructions
- Properly refrigerate, including leftover cooked foods.

# *Salmonella* species

## Treading on egg shells? Australia looks to tackle Salmonella problem

By Joe Whitworth+

06-Nov-2013

Egg handling hygiene to reduce food poisoning

# *Salmonella* spp.

- Salmonella causes two kinds of illness: (1) Gastrointestinal and (2) Typhoidal illness.
- Many kinds of food can lead to gastrointestinal illness: meats and eggs to fruits and vegetables, even dry foods (spices, raw tree nuts).
- Typhoidal illness associated with sewage-contaminated drinking water, or crops irrigated with sewage-contaminated water.

# *Salmonella* Sources

- Widely dispersed in nature.
- Can colonize intestinal tracts of vertebrates, including livestock, wildlife, domestic pets, and humans.
- Spread through the fecal-oral route and contact with contaminated water.
- Various *Salmonella* spp. Isolated from outside of egg shells, and inside the egg.
- Fresh produce also a source of major outbreaks, particularly recently.

# *Salmonella* Cross Contamination

- **Cross Contamination:** Salmonella spread from a contaminated food, animal, or infected food handler, to other foods, objects, or surfaces in the environment.
- Handling pets or wildlife (or their water, soil, food/water bowls), then handling food, food-preparation utensils, or other objects in the environment.
- Hard to wash off of food, even with soapy water.
- **Controls**: cooking, hand-washing, separate raw and cooked foods, refrigerate at 40F or below.

# Many “bad” bugs, but streamlined Food Safety plans and measures.