

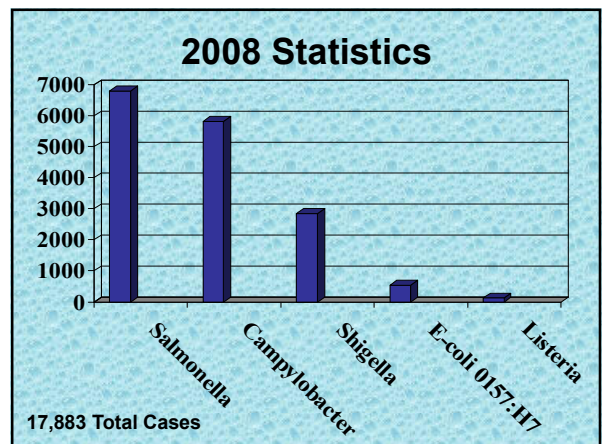
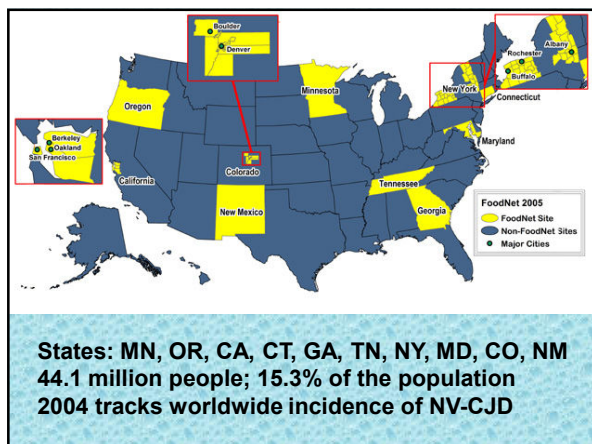


### Microbiology

- 200 known diseases transmitted through food
- 2007; 6 to 81 million food born illnesses
- Over 9,000 deaths
- Food Safety has been identified as a major concern of consumers

### FoodNet

- FoodNet Surveillance System (FDA, CDC, and the USDA) 1996
- Track pathogens; Campylobacter, E-coli 0157:H7, Lysteria monocytogenes, Salmonella, Shigella, Yersina enterocolitica, and Vibrio
- 1997 added Cyclospora, and Cryptosporidium; parasitic protozoa



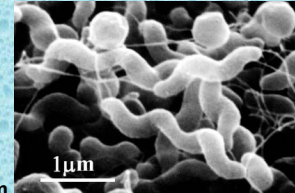
### Statistics

- **Campylobacter and Salmonella**
  - Majority of cases in people under 9
  - Vast majority less than 1 year of age
- **More males than females**
- **Spike of food born illness in the summer months**



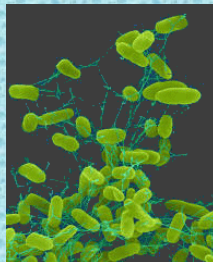
### Campylobacter jejuni

- 2<sup>nd</sup> most common cause of sickness
- Raw chicken, meats, sushi, etc
- Nausea, vomiting, diarrhea, cramps, and bloody diarrhea (sometimes)
- Children under 5; problem in day cares
- Onset 2-5d lasts a week

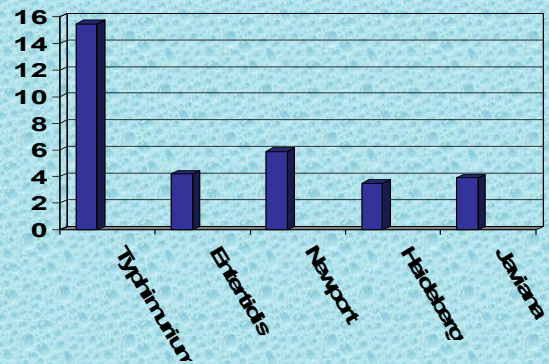


### Salmonella ssp

- Many types
- *S. typhi* = Typhoid Fever
- Nausea, vomiting, abdominal cramps, diarrhea, fever, headache
- 12-72 h onset
- Few as 100 cells; lasting 1-2 d
- Poultry, raw meats



### Top Salmonella Ssp; per 100,000 cases



### Escherichia-coli O157-H7

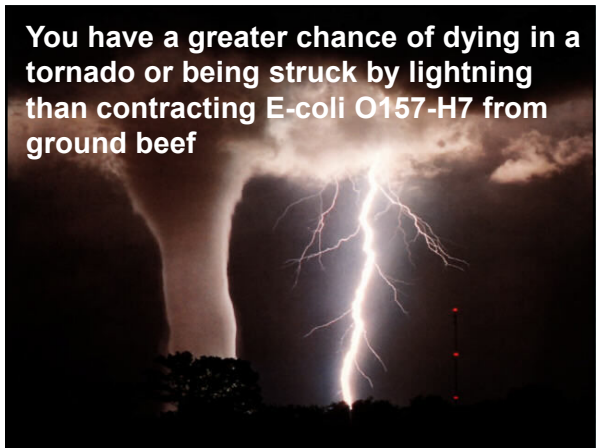
- Most E-coli are harmless
- O157-H7 most harmful
  - Enterohemorrhagic
- Severe abdominal cramping, watery diarrhea followed by bloody diarrhea, some vomiting
- Occasional Kidney Failure
- As few as 10 cells, lasts up to 8 days
- 2 – 8 days after exposure



### E-coli 0157:H7 and Ground Beef

- Jack-in-the-Box made E-coli a household name
- An adulterant if one cell is found in ground beef
- *E-coli* ssp. & *Salmonella* are constantly tested in ground beef





### Clostridium botulinum

- Very deadly toxin (nerve toxin)
- 18-36 h
- Resembles Drunkenness
- General weakness, vertigo followed by double vision, difficulty speaking, breathing, and swallowing, drooping eyelids, and constipation
- COD Asphyxia
- Cured meat, cans, canning vegetables
- Nitrite/ Nitrate

### Staphylococcus aureus

- Food Handlers Disease
- Can make 7 different toxins
- Nausea, vomiting, diarrhea, abdominal cramping
- Rapid onset; 12 h duration
- Nose, throat, hair, and skin of 50% of Americans

### Listeria monocytogenes

- Major concern in Ready-to-eat foods
- Can cause pregnant women to spontaneously abort or stillbirth
- Flu-like symptoms, persistent fever, gastrointestinal problems
- Few days to three weeks
- Can grow in refrigeration as low as 35-37° F

### Types of Food Born Illness

- Food born intoxication
- Food born infection
- Toxicoinfections
- Opportunistic Pathogens

### Types of Food Born Illness

- Food born Intoxication
  - The toxin must be ingested
  - *Staph gastroenteritis*
  - *C. botulinum*
- Food born Infection
  - Cells have to be alive
  - Cells colonize in the body and then release toxin
  - *Salmonella, Campylobacter, E-coli 0157:H7*

## Types of Food Born Illness

- **Toxico-Infection**
  - Live cells are ingested, produce spores, die, then release toxin as they die
  - *Clostridium perfringes, Bacillus cereus, Bacillus antracis*
- **Opportunistic Pathogen**
  - Not commonly pathogens
  - Attack immuno-compromised people
  - *Citrobactor, KleibSELLa, and Aeromonas*

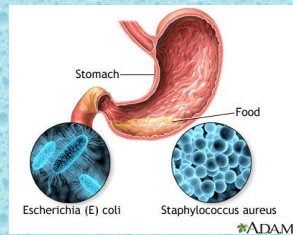
## How to Prevent Contamination

- **Thermal Pasteurization**
- **Feed Additives**
- **Steam Vacuums**
- **Animal and Carcass Washes**
  - Dehairing (not used)
  - Lactic Acid Wash
  - Acetic Acid Wash
  - Hot Water Wash



## Top Foods

- **Foods that have caused illness**
- Unpasteurized Juices
- Fresh Vegetables
- Raw or Undercooked Eggs
- Chicken
- Tuna
- Potato or Macaroni Salads
- Cream-filled Pastries
- Alfalfa Sprouts
- Fresh Fruits
- Bottom feeding Shellfish



## Main Causes

- **Undercooking**
- **Interrupted Cooking**
- **Cross Contamination**
  - Not washing cutting board
  - Not cleaning counter
- **Not keeping hot food hot or cold food cold**
- **Not washing hands**
  - Bathroom
  - After handling raw meat
  - Snotty noses
- **Generally not using common sense**