

PREVENTING FOODBORNE ILLNESS

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In the news...

Green onions (Chi Chi's) Oct-Dec 2003

- TN, GA, NC, PA
- 4 deaths

Sliced tomatoes (Sheet's) 2004

- PA, OH, MD, WV, VA
- 485 *E. coli* infections

Fresh Cut Spinach Nov 2006

- 26 states
- > 200 *E. coli* infections, 4 deaths

Lettuce (Taco Bell) Dec 2006

- PA, DE, SC, NJ
- 71 *E. coli* infections

Lettuce (Taco John's) Dec 2006

- MN, IA
- 87 *E. coli* infections

Spinach Aug 2007

- 8,000 cartons of fresh spinach recalled.



Five commodity groups account for > 75% of produce related outbreaks

- ▣ Leafy greens 30 %
- ▣ Tomatoes 17 %
- ▣ Cantaloupe 13%
- ▣ Herbs (basil, parsley) 11%
- ▣ Green onions 5%



Why the increase in produce-related foodborne illnesses?

- ▣ Some people are more vulnerable to foodborne illness:
 - Young children or elderly people.
 - Immuno-compromised individuals.
- ▣ New ways of transmitting organisms:
 - Widespread food distribution system.
 - New food formulations and handling practices.
 - Changes in food choices.
- ▣ New or evolving pathogens:
 - Example - *E. coli* 0157:H7.



Why Should We Care?

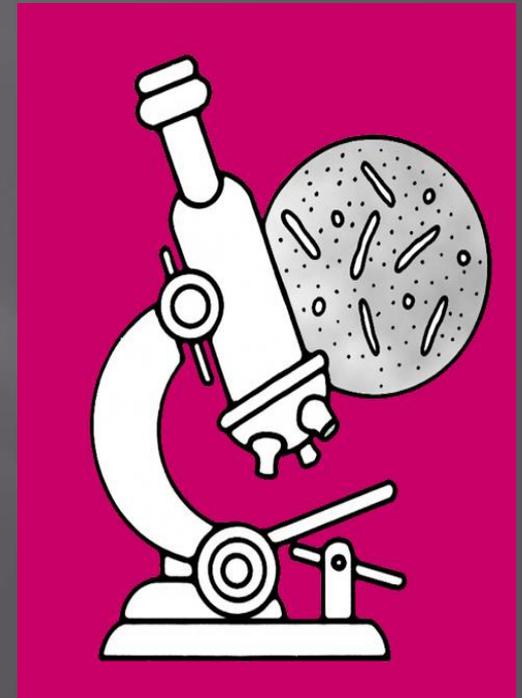
Every year foodborne illnesses result in an estimated:

- 76 million cases of foodborne illness.
- 325,000 people hospitalized for foodborne illness.
- 5,200 needless deaths each year.
- Economic losses between 10-83 billion dollars.



Food Microbiology

- ▣ Microorganisms are small, living unicellular or multicellular.
- ▣ They include bacteria, viruses, yeasts, molds, and parasites.
- ▣ They can be....
 - The good
 - The bad, and
 - The ugly!



Kinds of Microorganisms

- ▣ The Good (helpful):
 - Add them to foods or they are there naturally.
 - They ferment foods to preserve them and/or create unique flavors and textures.
 - Examples: cheese, yogurt, sour cream, bread, sauerkraut and pickles.



Kinds of Microorganisms

- ▣ The Bad (spoilage)
 - Change foods and cause them to “go bad” or spoil.
 - Examples: Discolored, mushy, or fuzzy vegetables; sour milk; and slimy, putrid meat.



Kinds of Microorganisms

- ▣ The Ugly (disease-causing, pathogenic):
 - Illness can range from mild to life-threatening.



Microorganisms that cause...

food spoilage

affect aroma,
texture, or
appearance of food

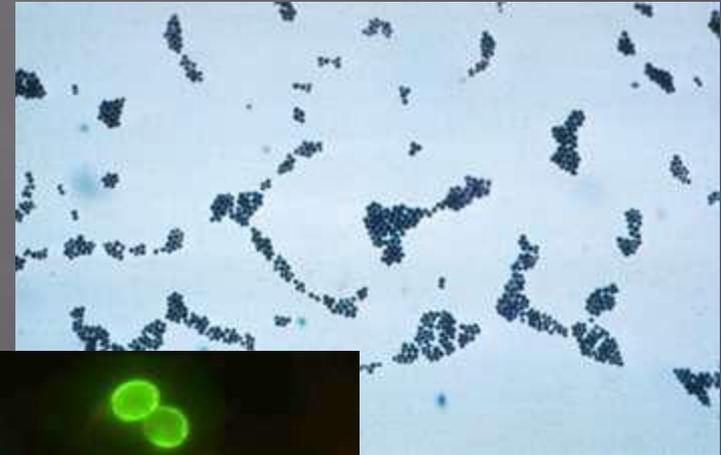
foodborne illness

may not affect aroma,
texture, or
appearance of food.

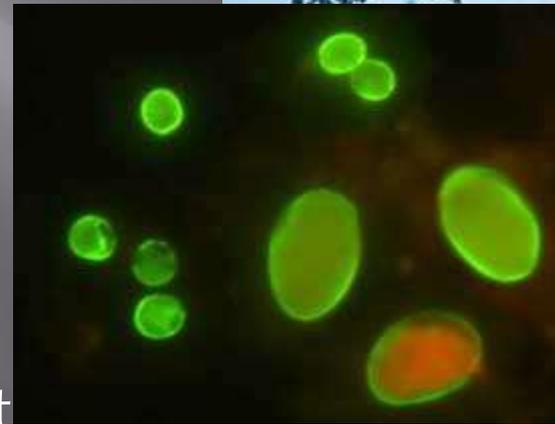
Only laboratory testing can tell if harmful microorganisms or toxins are present – some are difficult to detect or cannot be detected.

Microorganisms that cause Foodborne Illness

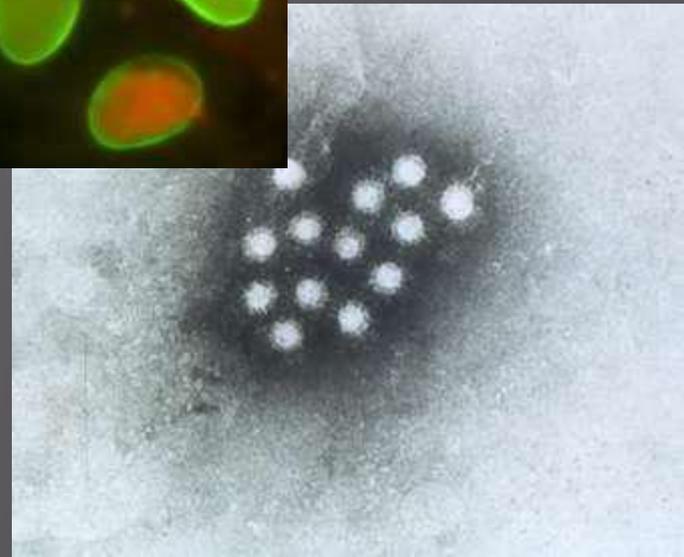
Bacteria – Single-celled organisms that live independently.



Parasites – Intestinal worms or microscopic protozoa that live in a host animal or human.



Viruses – Small particles that live and can only replicate in a host.



Examples of Harmful Microorganisms of Concern in Fresh Produce

Bacteria

- ▣ *Salmonella* species
- ▣ *E. coli* O157:H7
- ▣ *Shigella* species
- ▣ *Listeria monocytogenes*
- ▣ *Vibrio cholera*

Viruses

- ▣ Hepatitis A virus
- ▣ Norwalk-like virus

Parasites

- ▣ *Cryptosporidium*
- ▣ *Giardia*
- ▣ *Cyclospora*
- ▣ *Toxoplasma*

Recalls and Outbreaks Associated with Produce

E. coli O157:H7 Iceberg lettuce, spinach, radish, sprouts, apple cider/juice

Salmonella spp. Tomatoes, bean sprouts, sliced watermelon, sliced cantaloupe, coleslaw & onions, alfalfa sprouts, root vegetables, juice

Listeria monocytogenes Cabbage

Hepatitis A Virus Iceberg lettuce, raspberries, strawberries

Cryptosporidium Apple cider

Cyclospora Raspberries, mushrooms, green onions

Where can pathogens be found?

In soils...

- *Listeria monocytogenes*
- *Bacillus cereus*
- *Clostridium botulinum*
- *Clostridium perfringens*



In human and animal gut...

- *Salmonella species*
- *E. coli O157:H7*
- *Shigella species*
- *Campylobacter jejuni*
- Viruses and parasites



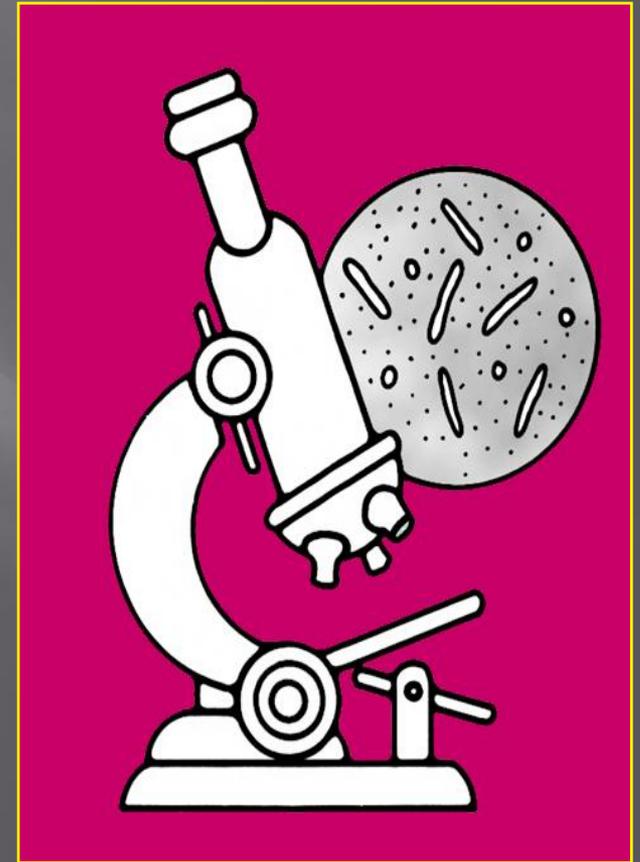
Contamination comes from...

- Wild or domestic animals.
- Improperly composted animal manure.
- Fruits and vegetables dropped on the ground have a higher chance of being contaminated by manure.
- Water may carry and spread organisms.
- Farm and packing house workers



Bacteria...

- ▣ Cause the greatest number of foodborne illnesses.
- ▣ Single-celled organisms that live independently.
- ▣ Invisible to the naked eye: Must be magnified 1,000 times to be seen.
- ▣ 400 million bacteria are equal to a grain of sugar in size.



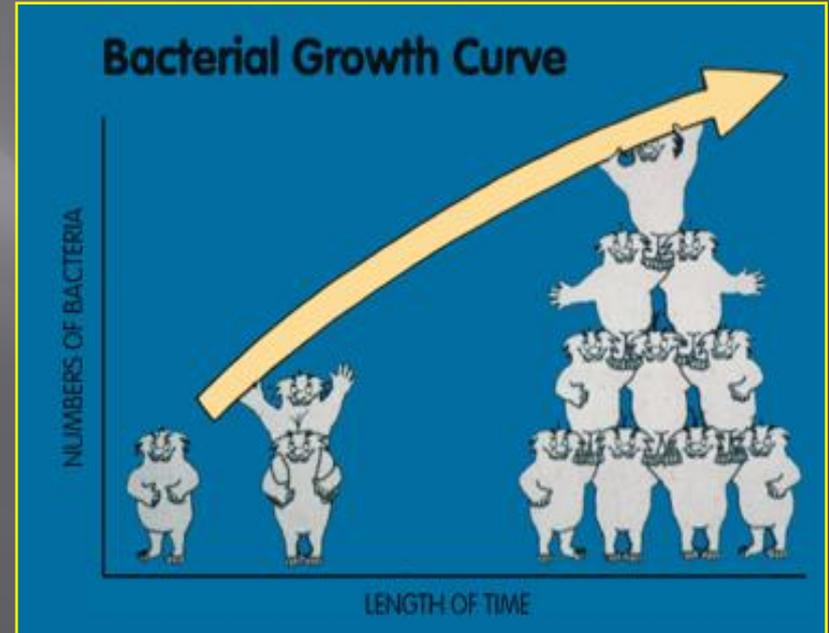
To Grow & Cause Illness, Bacteria Need:

- ▣ Moisture, found in most foods, including fruits and vegetables.
- ▣ Nutrients, provided by most foods.
- ▣ Warmth, especially room temperature or a little higher.
- ▣ Time



Bacteria Increase in Number by Dividing in Two

- ▣ With ideal conditions, they double every half hour.
- ▣ 1 becomes 2, 2 become 4, 4 become 8, and so on...
- ▣ In 12 hours, 1 cell could multiply into 33 million cells!
- ▣ Usually you start with many bacterial cells, not just one.



E. Coli vs. *E. coli* O157:H7

E. coli: a common microbe in animal and human intestinal tracts.

Most strains of *E. coli* are not harmful.



10-100 cells of “*E. coli* O157:H7” can cause severe illness, kidney failure...death!



E. Coli O157:H7

Naturally exists in the intestinal tracts of many animals without symptoms:

- cattle, deer, sheep, dogs, cats, birds, humans...

Can contaminate/ grow on fresh produce:

- fresh cut cantaloupe
- watermelon cubes
- shredded lettuce
- spinach
- sliced cucumbers



In humans, it causes severe cramps, bloody diarrhea, vomiting, dehydration.

- Onset 3 - 9 days; lasts 2 - 9 days, unless there are complications.
- Severe complications can include kidney failure, strokes, seizures, and sometimes death.

Salmonella species

- More than 2300 types.
- About 200 types cause human illness.
- Comes from intestinal tracts of poultry, pigs, cattle, horses, dogs, birds, and insects.
- Also can be carried by humans.
- Infective dose – a few cells to millions.
- Isolated from many types of raw fruits and vegetables – not a frequent event.
- Outbreaks linked to: eggs, tomatoes, bean sprouts, melons, unpasteurized orange juice and apple juice
- Illness causes nausea, vomiting, abdominal cramps, diarrhea, fever, chills, dehydration, and headache.
- Symptoms occur in 12 - 48 hours and last 2 - 6 days in otherwise healthy people.
- May last weeks in susceptible populations.
- Secondary problems such as reactive arthritis or pericarditis may result in some patients.



Listeria monocytogenes

- ▣ Widely distributed in nature.
 - In soil, sewage, fresh water sediments.
 - In silage, decaying plant matter.
 - In animal intestinal tracts.
- ▣ Animal carriers may not be sick.
- ▣ Found in raw foods.
 - Meats, unpasteurized milk.
 - Vegetables.
- ▣ Causes flu-like symptoms in healthy people.
- ▣ May progress to meningitis, blood poisoning, abortion in pregnant women, or death.
- ▣ Symptoms appear within 1 day to 3 weeks.
- ▣ Duration depends on treatment.
- ▣ High fatality rate in immune-compromised individuals.



Vibrio cholerae



- ▣ Found in human feces
- ▣ Causes diarrhea, abdominal cramps, nausea, vomiting, dehydration
- ▣ Approximately 1 in 20 infected persons has severe disease characterized by profuse watery diarrhea, vomiting, and leg cramps. In these persons, rapid loss of body fluids leads to dehydration and shock. Without treatment, death can occur within hours.

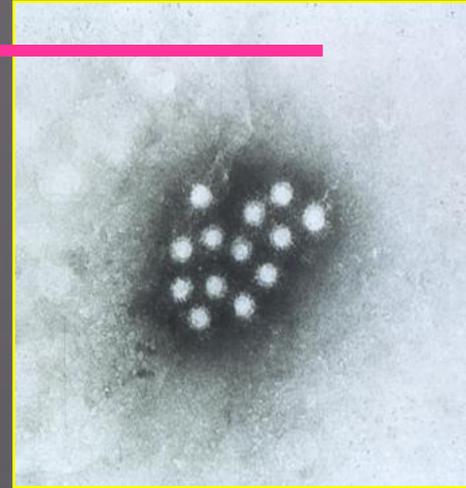
Shigella species

- ▣ Most who are infected with *Shigella* develop diarrhea, fever, and stomach cramps starting a day or two after they are exposed to the bacteria. The diarrhea is often bloody.
- ▣ Shigellosis usually resolves in 5 to 7 days.
- ▣ A severe infection with high fever may be associated with seizures in children less than 2 years old.
- ▣ Some persons who are infected may have no symptoms at all, but may still pass the *Shigella* bacteria to others.



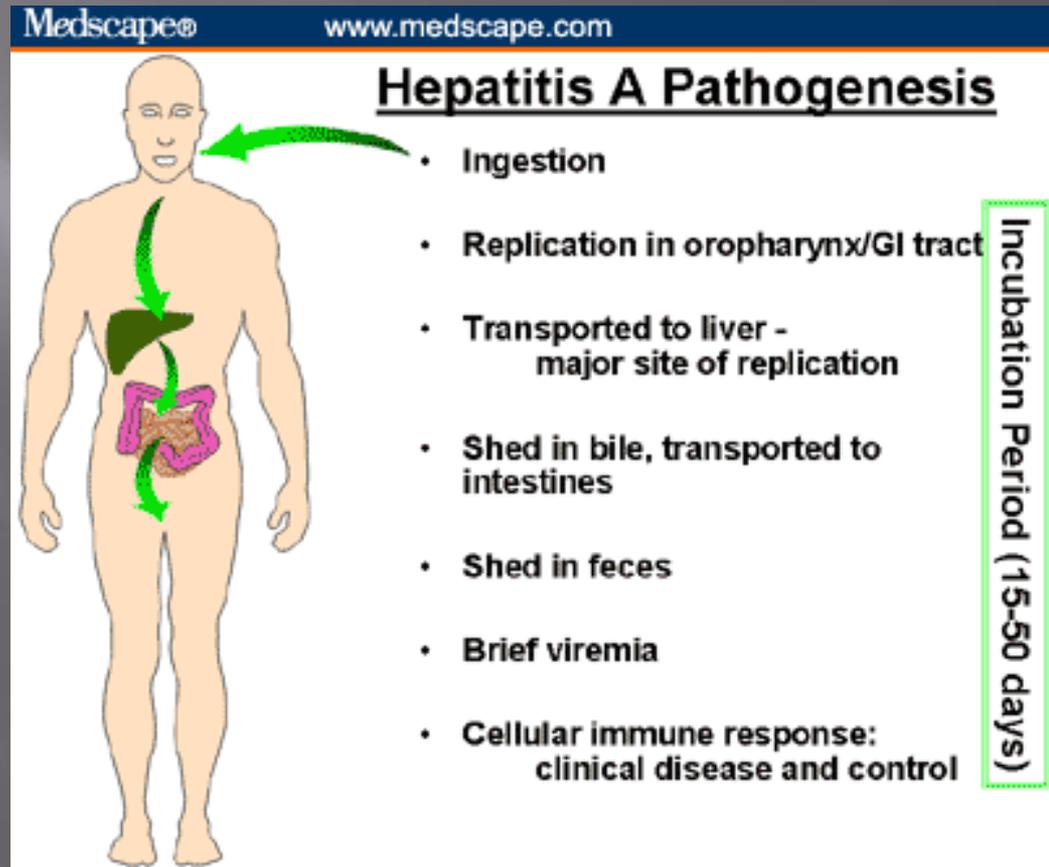
Viruses

- Excreted in feces by infected individuals.
- Can be carried by raw produce, uncooked food.
- Persists for weeks or months on crops or in soils.
- Examples
 - Hepatitis A on lettuce, raspberries, and strawberries.
- Viruses can be transmitted to plants and fresh fruits and vegetables by:
 - People.
 - Tractors, equipment, clippers.
 - Insects.
- Viruses can also cause plant and animal diseases.
- By preventing virus transmission, plant diseases can be decreased and produce safety can be increased.

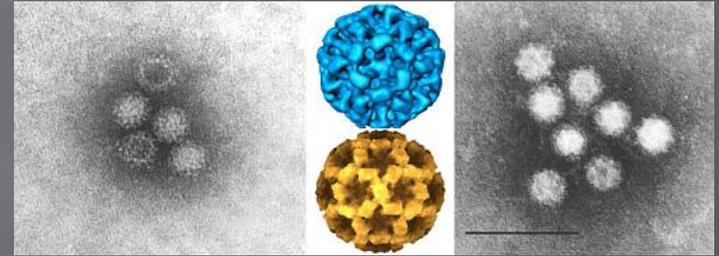


Hepatitis A

- ❑ Fecal-oral transmission (ie: foodborne)
- ❑ Infectious BEFORE symptoms develop
- ❑ An infected person can spread the disease to others well before the symptoms of Hepatitis A are present.
- ❑ It is primarily transmitted by person-to-person contact through fecal contamination, but can also be spread through food and water.
- ❑ Causes fever, nausea, vomiting, abdominal cramps, extreme fatigue, jaundice (affects the liver).
- ❑ Onset 15 - 50 days after ingestion.
- ❑ Lasts 1-2 weeks to months in severe cases.



Norwalk / Norwalk-like Viruses



- ❑ AKA: gastroenteritis, stomach flu
- ❑ Symptoms of norovirus illness usually begin about 24 to 48 hours after ingestion of the virus.
- ❑ Symptoms usually include nausea, vomiting, diarrhea, and some stomach cramping. Sometimes a low-grade fever, chills, headache, muscle aches, and a general sense of tiredness.
- ❑ In most people the illness is self-limiting with symptoms lasting for about 1 or 2 days. In general, children experience more vomiting than adults.
- ❑ People are unable to drink enough liquids to replace the liquids they lost because of vomiting and diarrhea. These persons can become dehydrated and may need special medical attention.
- ❑ Noroviruses are found in the stool or vomit of infected people. People can become infected with the virus in several ways, including:
 - eating food or drinking liquids that are contaminated with norovirus;
 - touching surfaces or objects contaminated with norovirus, and then placing their hand in their mouth;
 - having direct contact with another person who is infected and showing symptoms (for example, when caring for someone with illness, or sharing foods or eating utensils with someone who is ill).

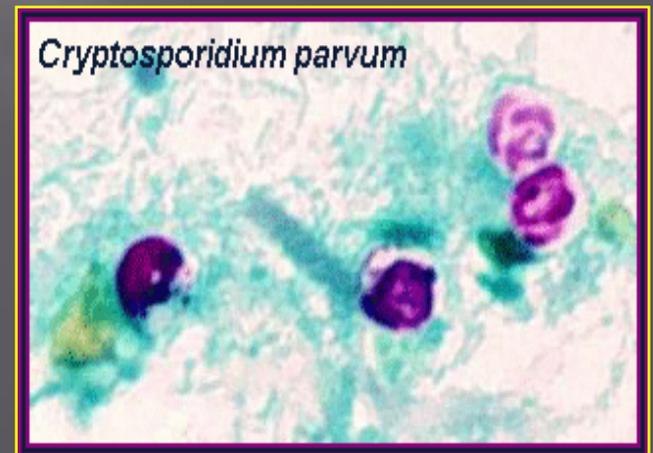
Parasites

- Exist as single-celled cysts outside in water or food; require animal or human intestinal tract to multiply and spread.
- Spread by fecal contamination of water or fresh produce.
- Symptoms 2-10 days after ingestion; can last a few days to weeks. Sometimes no symptoms.
- Examples of outbreaks:
 - *Giardia*: raw vegetables, fruits.
 - *Cryptosporidium*: unpasteurized apple juice.
 - *Cyclospora*: imported raspberries, basil, leafy greens.



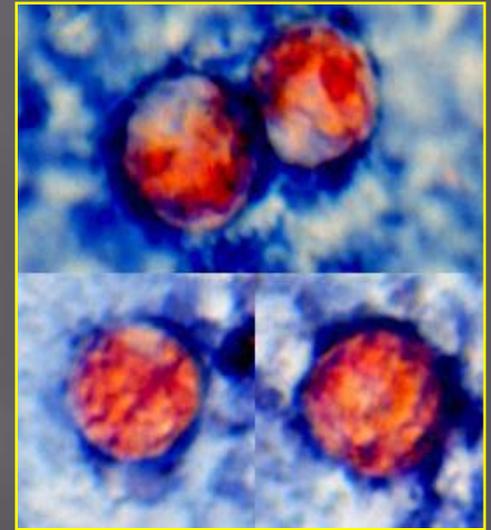
Cryptosporidium

- ▣ Cysts in water or food infect intestinal cells.
- ▣ Infection causes illness and allows the parasite to reproduce.
- ▣ Causes watery diarrhea, stomach cramps, nausea, and fever.
- ▣ Symptoms 2 -10 days after ingestion; can last 4 days to 4 weeks.



Cyclospora

- ▣ Cyclospora parasites infect the small intestine.
- ▣ Causes watery diarrhea (sometimes explosive), loss of appetite, bloating, stomach cramps, nausea, vomiting, muscle aches, low-grade fever, weight loss, and fatigue.
- ▣ Some cases are without symptoms.
- ▣ Symptoms 1 week after consuming contaminated food or water, can last more than a month and can return later.



Cyclospora

Giardia

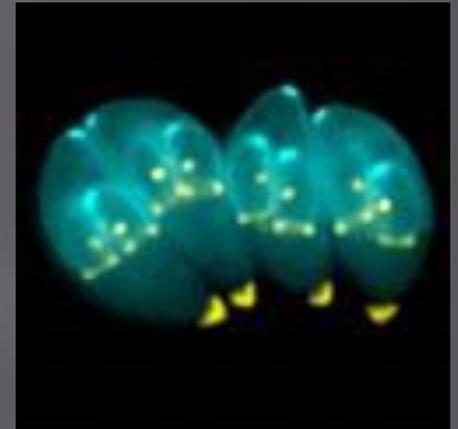
- ▣ Common parasite that infects animal and human intestines.
- ▣ Causes diarrhea, abdominal cramps, nausea, and vomiting.
- ▣ Symptoms 1 -2 weeks after ingestion of cysts in contaminated food or water.
- ▣ Lasts 4 - 6 weeks in healthy people, but can last years in some cases.



Giardia

Toxoplasma gondii

- ▣ Toxoplasma live in the intestinal tracts of animals, including cats and humans.
- ▣ Symptoms of Toxoplasmosis include headache, sore throat, muscle pain, enlarged lymph nodes, and flu-like symptoms.
- ▣ Women who are thinking about becoming pregnant should be especially careful about toxoplasmosis because this disease can infect the fetus and cause a malformation or abortion.



Controlling the Spread of Viruses and Parasites

- Train food handlers to practice proper hygiene
- Enforcement and reinforcement of hand washing



HAND WASHING

• Hand washing is the single most effective way to prevent the spread of infections.

- Wash your hands often and thoroughly, paying special attention to the area around and under your fingernails.

- Wash Hands:

- When arriving to work.
- Before and after eating.
- After using the restroom.
- After removing gloves.
- Before leaving work at the end of the day.

- Gloves are not a substitute for routine hand washing - rather an added protection.



Handwashing Information

- ▣ Study of handwashing
 - <2 times/day in restaurants, foodservice, healthcare settings
 - 94 % say they wash their hands
 - 68% of those observed wash their hands
- ▣ FDA estimates
 - poor handwashing contributes to 80 million cases of illnesses in U.S



Hand Washing



Proper Hand Washing Techniques



- Wet your hands with warm, running water and apply liquid or clean bar soap. Lather well.
- Rub your hands together vigorously for a least 10-15 seconds.
- Scrub all surfaces including the backs of your hands, wrists, between your fingers and underneath your fingernails.
- Rinse well. Make sure the water is running from your wrists down to your fingers.
- Dry your hands with a clean, disposable paper towel.
- If you are in a public restroom, leave the water running when you're finished rinsing. After your hands are dry, use the paper towel to turn off the faucet.

Hand washing facilities

- Maintain in a sanitary condition.
- Provide clean running water and soap
- Provide hand soap
- Provide disposable hand towels
- Train, enforce, and reinforce hand washing



Temporary (Field) Handwashing Facilities

A basin, container, or outlet with an adequate supply of potable water

Soap and single-use towels

1 toilet facility and 1 hand washing facility per 20 employees

Within 1/4 -mile walk from field or closest vehicular access if necessary.

Not required for employees who perform field work for a period of 3 hours or less

Dispose of wastes carefully to prevent unsanitary conditions



Handwashing signs

Signs should be written in languages that all employees can read and understand.

Wash Your Hands!
¡Lávese Las Manos!

- 1 Wet Hands**
Mójese las manos
- 2 Soap**
Enjabónese
- 3 Wash for 20 seconds**
Lávese las manos por 20 segundos
- 4 Rinse**
Enjuáguese
- 5 Dry**
Séquese las manos
- 6 Turn Off Water with Paper Towel**
Cierre el grifo usando una toalla de papel

Nebraska
Lancaster EXTENSION

Provided by University of Nebraska-Lancaster Extension in Lancaster County
and the Lincoln-Lancaster County Health Department

Worker Hygiene and Personal Practices

- Train employees to follow good hygienic practices
- Toilet and handwashing facilities should be accessible to workers, properly located, and well supplied
- Workers with symptoms of infectious disease or open wounds should not handle fresh produce:
 - Diarrhea
 - Open lesions
 - Boils
 - Sores
 - Infected wounds
 - Jaundice
- Workers should be instructed to report such health conditions to their supervisors



Personal Practices

Smoking, eating, chewing gum, drinking beverages, or using tobacco should be confined to areas away from the growing area

If there is a significant risk for contamination, policies should be established to minimize this risk.



Blood and other bodily fluid policy

- Blood or body fluids, regardless of the source (human or animal), are possible sources of contamination from infectious microbial organisms
- Dispose of any food products and to properly clean/sanitize food contact surfaces that come into contact with body fluids



THE END

Food Safety Begins on the Farm

