

Recreational Water Illnesses



Exposure Assessment

- Methods of exposure:

- Skin
- Ingestion
- Inhalation



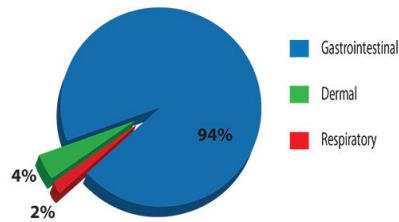
Gastrointestinal RWI outbreaks

- Transmitted in a fecal-oral mode
- Microbe incubates in the gastrointestinal tract
- Watery diarrhea released into the water
- Outbreaks occur over a period of several hours or days when the chlorine level drops below 1.0 ppm (mg/L)

Illness percentages

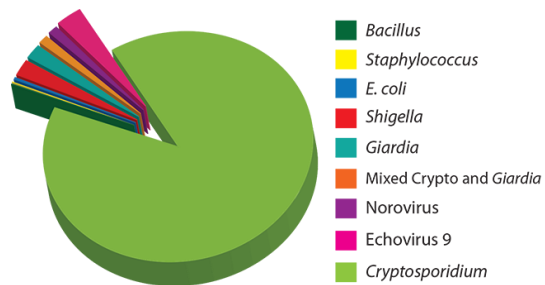
- Total Illnesses

Percentage of Total Illnesses



- Data excluded from CDC report

Microorganisms That Cause Acute Gastrointestinal Illness



Types of Microorganisms

- Viruses
- Bacteria
- Parasites
- Pathogenic Amoebae
- Fungi
- Algae

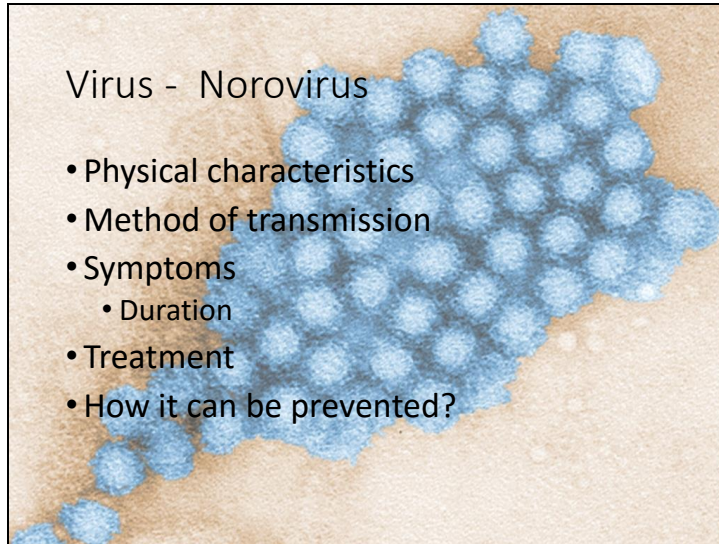
Virus

- The most common human viruses
 - Norovirus
 - Adenovirus
 - Rhinovirus
 - Influenza
 - Human Papilloma Virus (HPV)
- How are viruses spread?



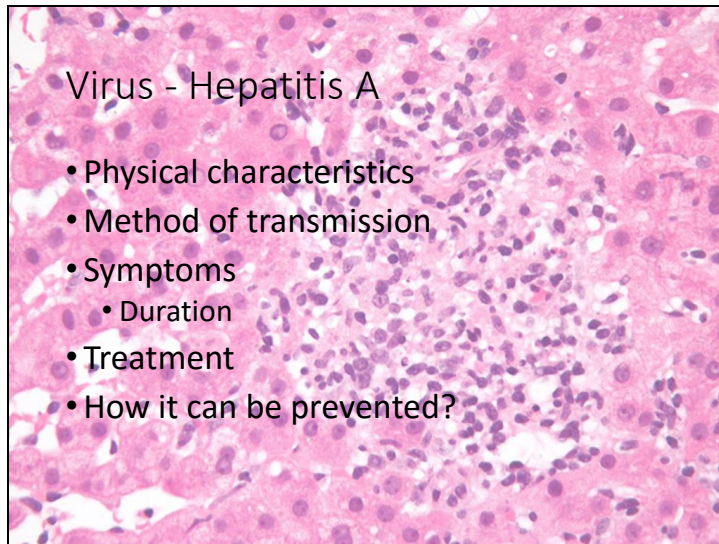
Virus - Norovirus

- Physical characteristics
- Method of transmission
- Symptoms
 - Duration
- Treatment
- How it can be prevented?



Virus - Hepatitis A

- Physical characteristics
- Method of transmission
- Symptoms
 - Duration
- Treatment
- How it can be prevented?



Bacteria

Bacteria

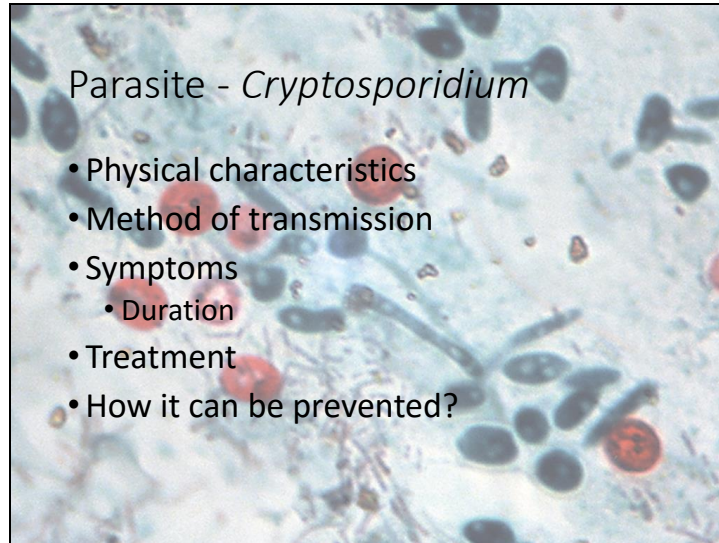
- *Pseudomonas*
- *Shigella*
- *E. Coli*
- *Legionella*
- All bacteria that cause RWI are
- quickly killed by 1 ppm chlorine

Bacteria - *E. Coli*

- Physical characteristics
- Method of transmission
- Symptoms
 - Duration
- Treatment
- How it can be prevented?

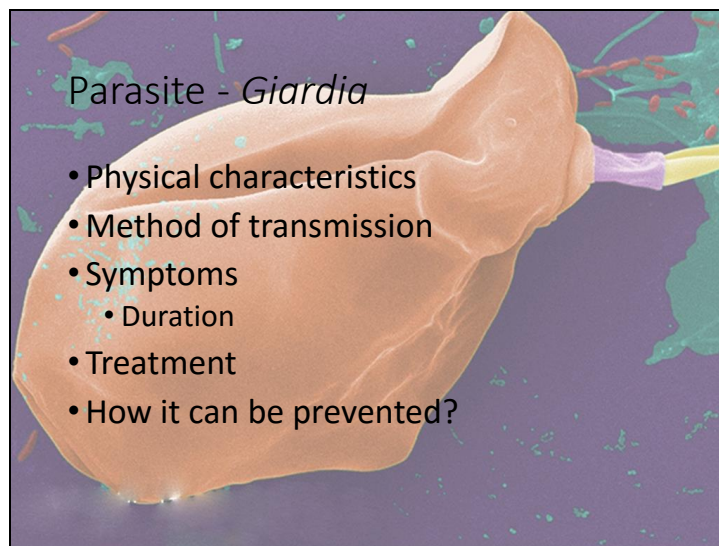
Bacteria - *Shigella*

- Physical characteristics
- Method of transmission
- Symptoms
 - Duration
- Treatment
- How it can be prevented?



Parasite - *Cryptosporidium*

- Physical characteristics
- Method of transmission
- Symptoms
 - Duration
- Treatment
- How it can be prevented?



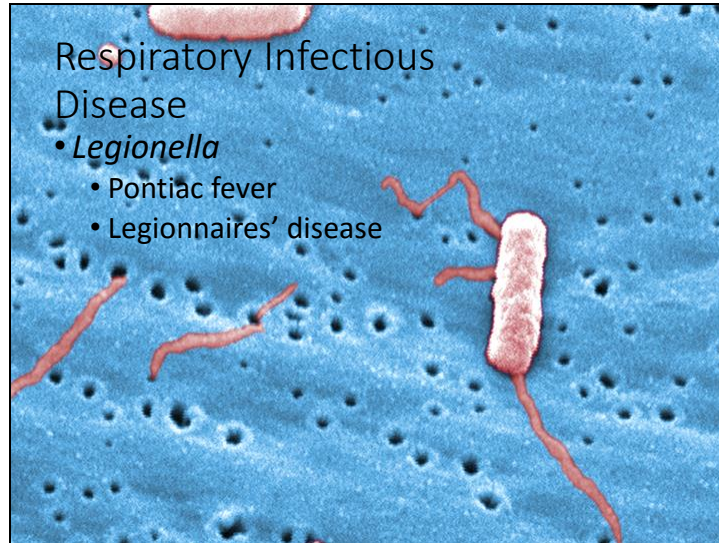
Parasite - *Giardia*

- Physical characteristics
- Method of transmission
- Symptoms
 - Duration
- Treatment
- How it can be prevented?



Warning Signs for Spas

- What are the indicators?
 - Disinfectant level
 - Slime
 - Foam
 - Odors
 - Cloudy water
 - Chlorine smell
 - Patron complaints



Legionnaires' Disease versus Pontiac Fever

	Legionnaires' disease	Pontiac fever
Clinical features	Pneumonia (cough, fever, chest pain)	Flu-like illness (fever, chills, malaise) without pneumonia
Radiographic pneumonia	Yes	No
Incubation period	2-14 days after exposure	24-48 hours after exposure
Etiologic agent	<i>Legionella</i> species	<i>Legionella</i> species
Attack rate*	< 5%	> 90%
Isolation of organism	Possible	Virtually never
Outcome**	Hospitalization common Case-fatality rate: 5-40%	Hospitalization uncommon Case-fatality rate: 0%

* Percent of persons who, when exposed to the source of an outbreak, become ill.
** Percent of persons who die from Legionnaires' disease or Pontiac fever.

Germ Inactivation Times (CT Values)

- It is required that the pathogen be **99.9% inactivated**
- The CT value for the pathogen must be achieved
- The concentration (C) of free chlorine in ppm multiplied by time (T) in minutes
 - CT value = C x T

The CT Inactivation Value

- The CT value for Crypto is 255 hours at 1 ppm
- To determine the length of time needed to disinfect a pool after a diarrheal accident at 15 ppm:
 - Time = 255 hours ÷ 15 ppm = 17 hours

CT value for *Giardia* is 45:

- Time = 45 ÷ 15 ppm = 3 minutes

Diarrheal Incident

- Response plan
- CT values

Free Chlorine Concentration	Disinfection Time
10 ppm (mg/L)	1,530 minutes (25.5 hours)
20 ppm (mg/L)	765 minutes (12.75 hours)
40 ppm (mg/L)	383 minutes (6.5 hours)

Formed Fecal Incident

- Response plan
- CT values

Free Chlorine Concentration	Disinfection Time
1.0 ppm (mg/L)	45 minutes
2.0 ppm (mg/L)	25 minutes
3.0 ppm (mg/L)	19 minutes

Fecal Response for Formed (Solid) Stool Incidents

- **Remove swimmers from the water**
- **While maintaining the pH at 7.5 or lower, raise the chlorine level to 2.0 ppm**
- **After 25 minutes, open the pool to normal activities**



Fecal Response for Diarrhea Discharge Incidents

- **Remove swimmers from the water**
- **While maintaining the pH at 7.5 or lower, raise the chlorine level to 20.0 ppm. Maintain this level for at least 12.75 hours.**
- **After 12.75 hours, backwash the filters to waste**
- **Reduce the chlorine back to normal operating ranges**
- **When the chlorine levels are back within normal operating ranges, open the pool to normal activities**

When Handling Contaminated Material

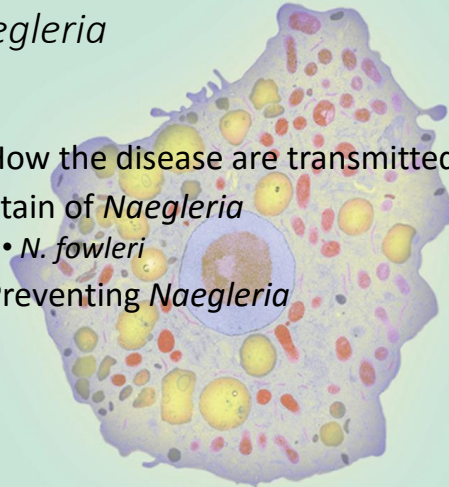
- **Wear rubber gloves**
- **Remove excess contaminant material**
- **Disinfect all surfaces that contamination may have touched**
- **Follow regulatory guidelines when disposing of contaminated material**
- **Wash your hands thoroughly**

Vomit and Blood Contamination in Pool Water

- Pool water is unlikely to spread illness via vomit or blood
- Vomiting while swimming is a common event
- Noroviruses are the most likely germs to be spread by vomit
- Germs (e.g., Hepatitis B virus or HIV) found in blood are spread when infected blood or certain body fluids get into the body and bloodstream

Naegleria

- How the disease are transmitted
- Stain of *Naegleria*
 - *N. fowleri*
- Preventing *Naegleria*



Acanthamoeba

- *Acanthamoeba*
 - Eye
 - Central nervous system
 - Generalized infections
- Prevention



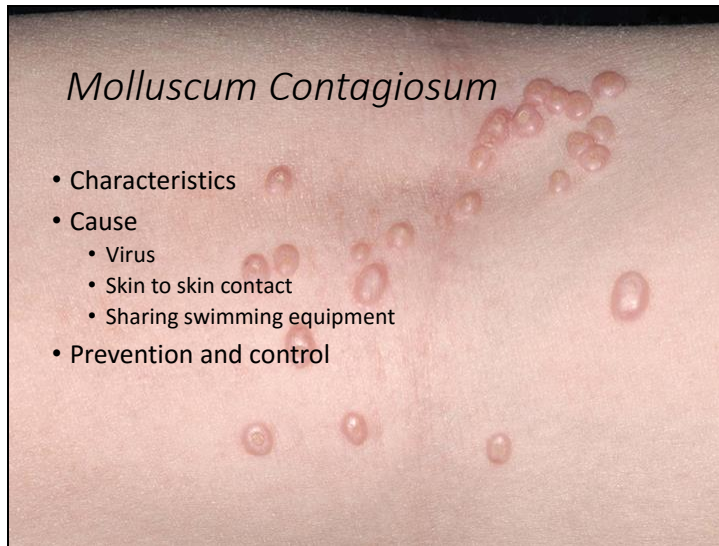
Athlete's Foot

- Caused by ringworm
- Prevention and control



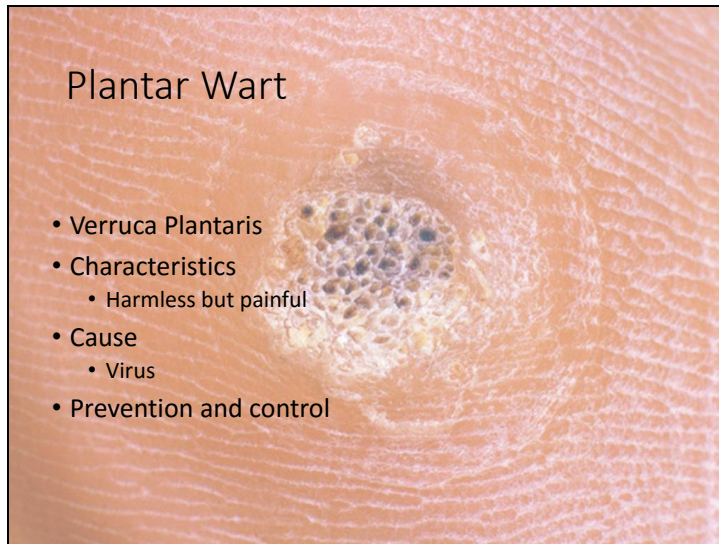
Molluscum Contagiosum

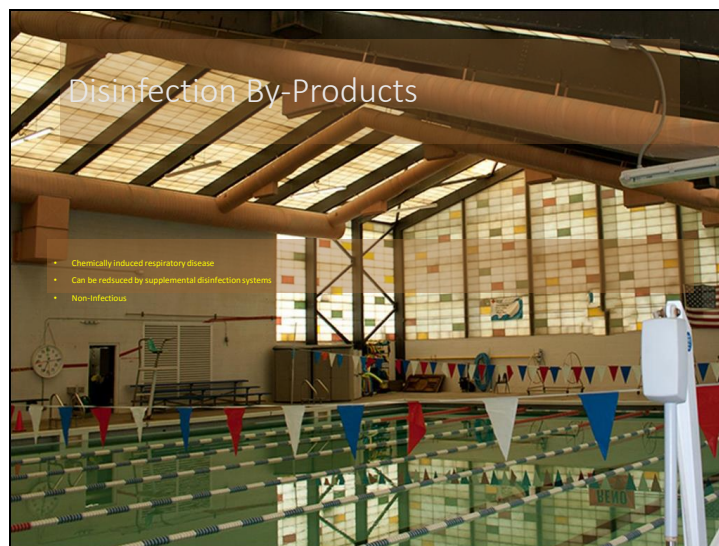
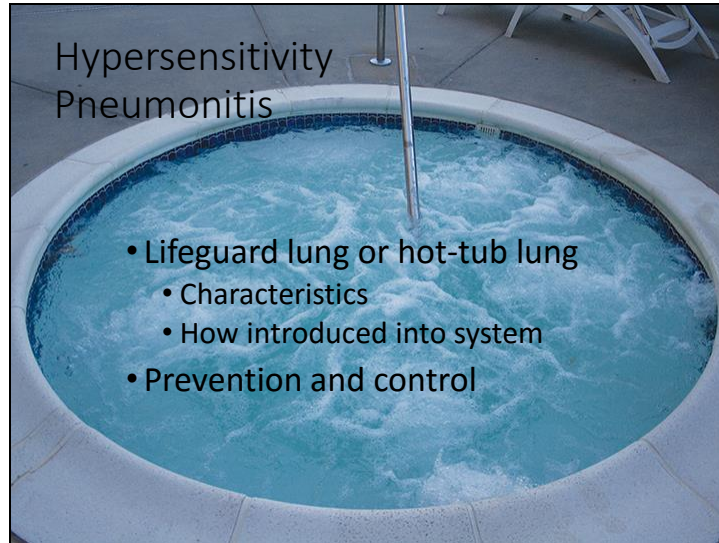
- Characteristics
- Cause
 - Virus
 - Skin to skin contact
 - Sharing swimming equipment
- Prevention and control



Plantar Wart

- Verruca Plantaris
- Characteristics
 - Harmless but painful
- Cause
 - Virus
- Prevention and control





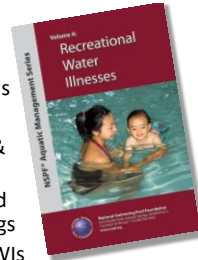
Good Pool Operating Practices

- Maintain proper disinfectant levels at all times
- Have all children use the bathroom before entering the pool
- Require every swimmer to shower before entering the pool
- Prohibit pool use for people with open wounds/sores or known infections
- Work with local and state health departments

Recreational Water Illness Training

• This advanced RWI
training course covers:

- Risk Management for RWIs
- Microbes & Disease
- Gastrointestinal, Dermal & Respiratory RWIs
- Other Microorganisms and Diseases in Aquatic Settings
- Methods for Control of RWIs



See www.nspf.org for more information

