

424 Aviation Road NE
Calgary, Alberta, T2E 8H6, Canada
Phone: + 1 (403) 243-3285, Fax: + 1 (403) 243-6199
E-mail: resources@cawst.org, Website: www.cawst.org

CAWST, the Centre for Affordable Water and Sanitation Technology, is a nonprofit organization that provides training and consulting to organizations working directly with populations in developing countries who lack access to clean water and basic sanitation.

One of CAWST's core strategies is to make knowledge about water common knowledge. This is achieved, in part, by developing and freely distributing education materials with the intent of increasing the availability of information to those who need it most.

This document is open content and licensed under the Creative Commons Attribution Works 3.0 Unported License. To view a copy of this license, visit <http://creativecommons.org/licenses/by/3.0> or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California 94105, USA.



You are free to:

- Share – to copy, distribute and transmit this document
- Remix – to adapt this document



Under the following conditions:

- Attribution. You must give credit to CAWST as the original source of the document. Please include our website: www.cawst.org

CAWST will produce updated versions of this document periodically. For this reason, we do not recommend hosting this document to download from your website.



CAWST provides mentorship and coaching on the use of its education and training resources.

Stay up-to-date and get support:

- Latest updates to this document
- Other workshop & training related resources
- Support on using this document in your work

www.cawst.org

This presentation is used with
Lesson Plan 5: Disease
Transmission in the Introduction to
Environmental Sanitation Trainer
Manual.

Available at

www.cawst.org/resources



Environmental Sanitation Disease Transmission



Learning Outcomes

1. Identify the four types of pathogens.
2. Identify different transmission routes of diseases.
3. Identify diseases related to environmental sanitation.
4. Explain how environmental sanitation can prevent the transmission of diseases.



What is a Pathogen?

*Any living organism that
causes disease*



Types of Pathogens

- 1. Viruses:** (0.02 – 0.2 microns), unable to reproduce by themselves
- 2. Bacteria:** (0.2 – 5 microns), most common living things found in human and animal feces
- 3. Protozoa:** (4 – 20 microns), may be able to form cysts
- 4. Helminths:** (40 – 100 microns), worms and flukes, require a host and passed in human and animal feces



Size Comparison

Smallest



- Virus**
- Bacteria**
- Protozoa**
- Helminth**

○ Virus (0.02 to 0.2 micron)

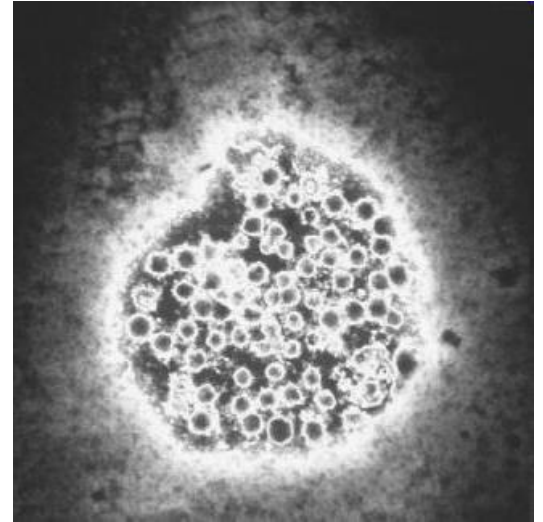
○ Bacteria (0.2 to 5 microns)

○ Protozoa
(4 to 20 microns)

○ Helminth
(40 to 100 microns)

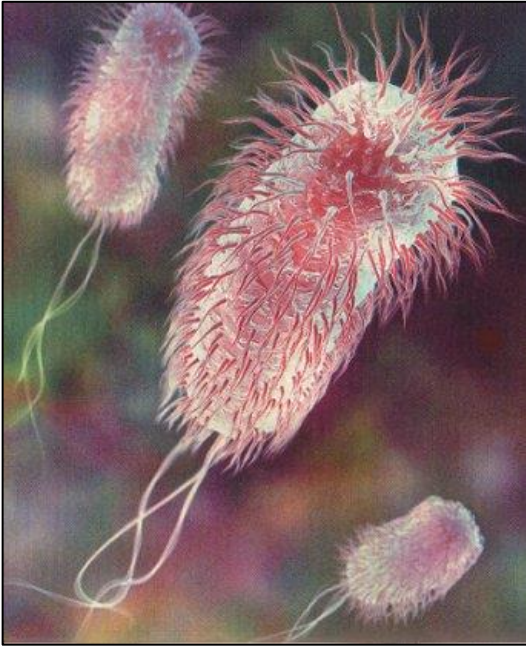
Viruses

- Hepatitis A and E
- Unable to reproduce by themselves
- Must use another living thing called a host
 - Microorganism, animal, human
- Water cannot spread HIV or influenza viruses

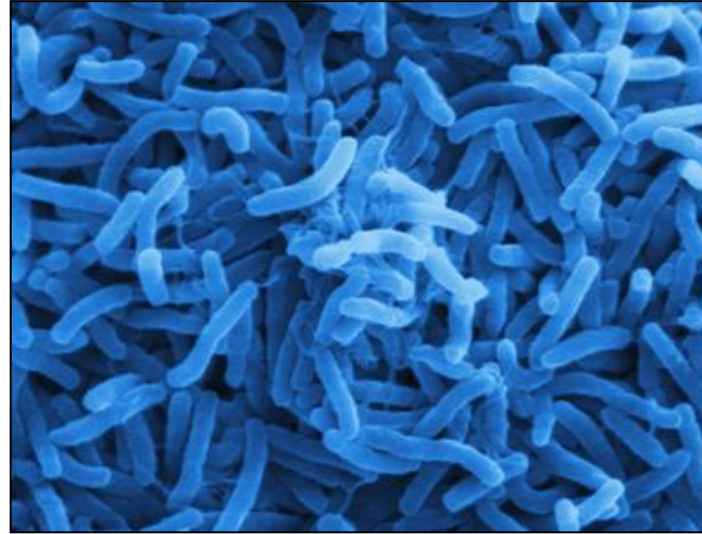


Hepatitis A

Bacteria



Escherichia coli



Cholera

- Most common living thing found in feces
 - 1 gram = billions of bacteria
- Diarrhea is the major symptom of water-related diseases
 - Cholera, typhoid, shigellosis

Bacteria in Action

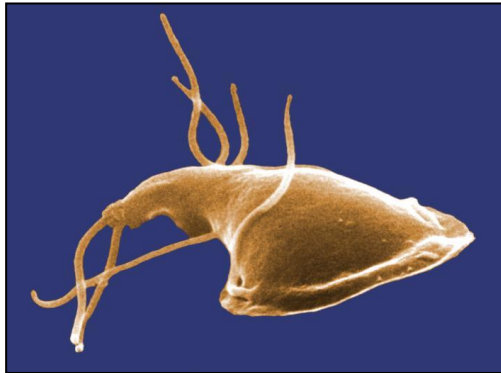


Protozoa

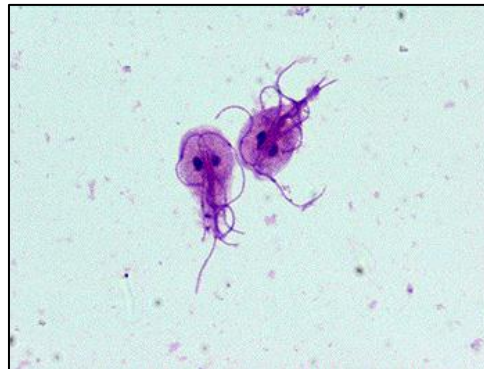


Cryptosporidium cyst

- Some need a host to survive
- Form cysts resistant to chlorine
- Some can stay alive outside of a host
- *Entamoeba histolytica*,
Cryptosporidium, *Giardia*



Giardia (side view)
(Credit: CDC, 1982)



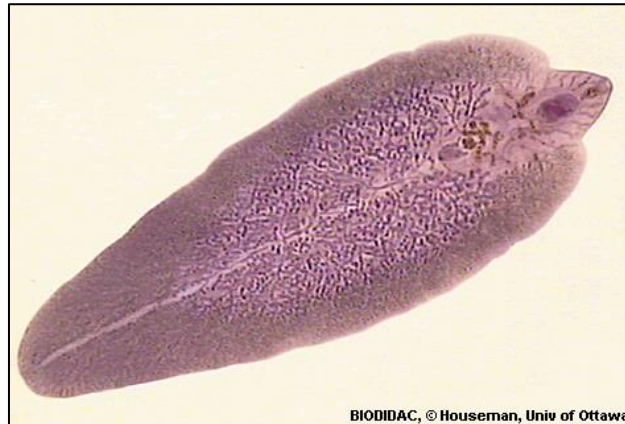
Giardia (top view)
(Credit: Mount Sinai Hospital)



Entamoeba histolytica
(Credit: Science Photo Library)

Helminths

- Schistosomiasis (bilharzia)
- *Dracunculus medinensis* (guinea worm)
- *Fasciola* (liver flukes)
- Round worm
- Hook worm
- Tape worm



Liver Fluke
(Credit: Houseman, BIODIDAC)



Guinea Worm
(Credit: Gubb, The Carter Center, Ghana, 2007)

Review

1. What is a pathogen?

*Any living organism that
causes disease*



Review

2. What are the four types of pathogens in order from smallest to largest?

1. *Viruses*

2. *Bacteria*

3. *Protozoa*

4. *Helminths*



Diseases related to Environmental Sanitation

- Drinking water contaminated with excreta
- Washing in water contaminated with excreta
- Lack of water for basic hygiene
- Contact with soil contaminated with excreta
- Insects that breed or live in standing water
- Insects that breed or live in animal excreta
- Rodents that breed or live in unsanitary conditions

Diseases Related to Environmental Sanitation

Plague

Cholera

Guinea worm

Schistosomiasis

Giardiasis

Shigellosis

Scabies

Leishmaniasis

Trachoma

Dysentery

Typhoid

Yellow fever

Hook worm

Ascariasis

Cryptosporidiosis

Dengue fever

Hantavirus



Questions

1. Symptoms?
2. Pathogen?
3. Transmission?
4. Prevention?



Cholera

1. Symptoms:

- Watery diarrhea
- Nausea, vomiting
- Can lead to death



(Credit: Connect.in.com)

2. Pathogen: Bacteria (*Vibrio cholerae*)

Cholera

3. Transmission:

- Water and food contaminated with feces

4. Prevention:

- Sanitation facilities (e.g., latrines)
- Proper hygiene practices
- Safe drinking water and food



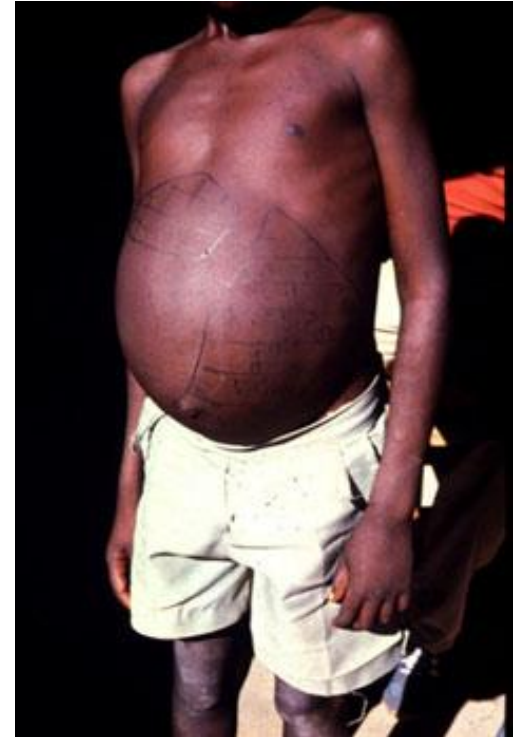
Schistosomiasis

1. Symptoms:

- Rashes and itchy skin
- Fever, chills, cough, muscle aches
- Blood in urine and stools

2. Pathogen: Helminth

(*Schistosoma haematobium*)



(Credit: www.path.cam.ac.uk)



(Credit: Natural History Museum, London)

Schistosomiasis

3. Transmission:

- Bathing or swimming in water contaminated with feces or urine

4. Prevention:

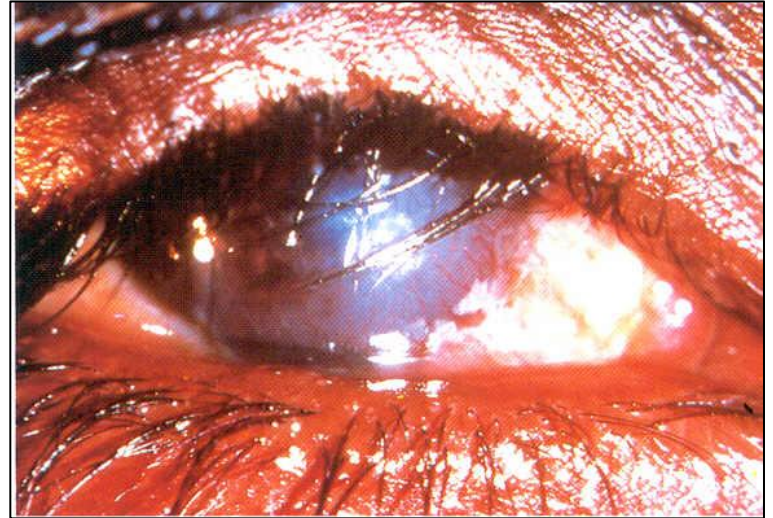
- Sanitation facilities
- Hygiene education and practices
- Design of water resources projects



Trachoma

1. Symptoms:

- Eye discharge
- Blurred vision
- Severe eye pain
- Itchiness in the eyes
- Irreversible blindness



(Credit: WHO)

2. Pathogen: Bacteria (*Chlamydia trachomatis*)

Trachoma

3. Transmission:

- Person-to-person
- Eye discharge on fingers, flies



(Credit: UK National Health Service)

4. Prevention:

- Facial cleanliness and personal hygiene
- Adequate water supply for hygiene
- Disposal of human waste to reduce flies

Ascariasis

1. Symptoms:

- Often no symptoms
- Diarrhea, abdominal pain, general malaise, weakness
- Impairs nutrition, growth, physical development



Adult female roundworm
(Credit: CDC Division of Parasitic Diseases)

2. Pathogen: Roundworm (*Ascaris lumbricoides*)

Ascariasis

3. Transmission:

- Water or food contaminated with eggs
- Children who play in contaminated soil and then put their hands in their mouths

4. Prevention

- Sanitation to reduce soil contamination with infective eggs
- Treating excreta before using as fertilizer



Malaria

1. Symptoms:

- Fever, headache, vomiting 10-15 days after mosquito bite
- Can disrupt blood supply to vital organs

2. Pathogen: Protozoa (Plasmodium)



Malaria patients in India
(Credit: Rediff News, 2010)

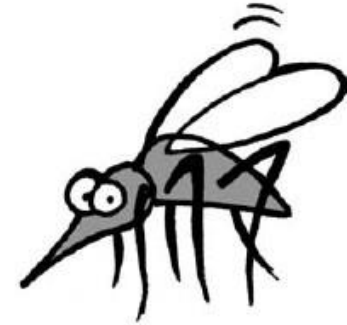
Malaria

3. Transmission:

- Bite from infected Anopheles mosquito

4. Prevention:

- Bed nets
- Indoor residual spraying
- Wastewater management to reduce mosquito breeding
- Personal: Cover up, repellent, behaviour



Leishmaniasis

1. Symptoms:

- Cutaneous – most common, skin ulcers
- Mucocutaneous – destruction of nose, mouth, throat
- Visceral – most severe, affects vital organs



Cutaneous leishmaniasis
(Credit: WHO)

2. Pathogen: Protozoa (*Leishmania*)

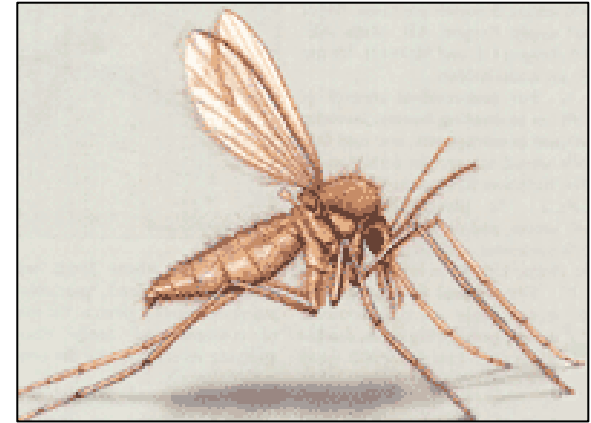
Leishmaniasis

3. Transmission:

- Bite from sandfly

4. Prevention:

- Animal excreta management
- Solid waste management
- Bed nets
- Indoor residual spraying



Sandfly (Credit: WHO)

Plague

1. Symptoms:

- Bubonic plague – swollen lymph nodes
- Pneumonic plague – deadly infectious disease

2. Pathogen: Bacteria (*Yersinia pestis*)



Swollen lymph nodes
(Credit: CDC)

Plague

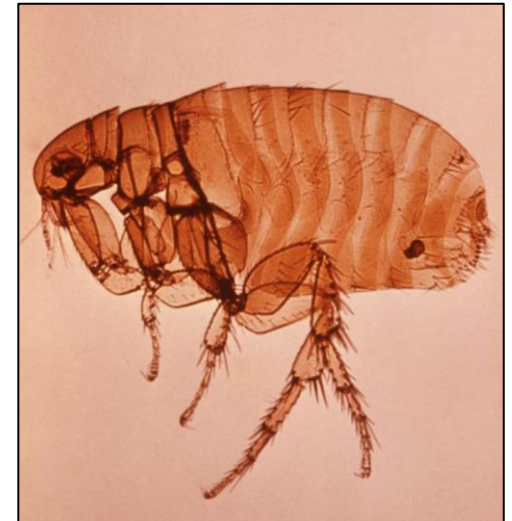
3. Transmission:

- One rodent to another by fleas, to humans from bite of infected flea
- Person-to-person transmission for pneumonic plague



4. Prevention:

- Rodent control
- Solid waste management



Flea (Credit: CDC)

Review

1. List some diseases caused by poor environmental sanitation.

Plague

Cholera

Guinea worm

Schistosomiasis

Giardiasis

Shigellosis

Scabies

Leishmaniasis

Trachoma

Dysentery

Typhoid

Yellow fever

Hook worm

Ascariasis

Cryptosporidiosis

Dengue fever

Hantavirus



Review

2. How can environmental sanitation help to prevent disease transmission?

- Drinking safe water
- Using latrines to safely dispose excreta
- Disposing wastewater to remove standing water
- Cleaning out drainage channels
- Treating and disposing solid waste
- Managing animal excreta
- Using insecticides and bed nets
- Rodent control

