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CAWST is a Canadian non-profit organization focused on the principle that clean water changes lives. Safe water and basic sanitation are fundamentals necessary to empower the world's poorest people and break the cycle of poverty. CAWST believes that the place to start is to teach people the skills they need to have safe water in their homes.

CAWST transfers knowledge and skills to organizations and individuals in developing countries through education, training and consulting services. This ever expanding network can motivate individual households to take action to meet their own water and sanitation needs.

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This presentation is used with  
Lesson Plan 4: Pathogens and  
Disease in the Biosand Filter for  
Technicians Trainer Manual.

Available at

[www.cawst.org/resources](http://www.cawst.org/resources)



# Pathogens



# Learning Expectations

1. List and describe the four different types of pathogens: *viruses, bacteria, protozoa, helminths.*
2. List some common water related diseases causes by pathogens.

# Disease

What makes us sick or causes disease?

- *Eating bad or contaminated food*
- *Drinking contaminated water*
- *Not washing our hands*
- *Bacteria*
- *Viruses*
- *Parasites*

# Pathogens

What is a pathogen?

*A living thing that causes sickness  
or disease*

# Types of Pathogens

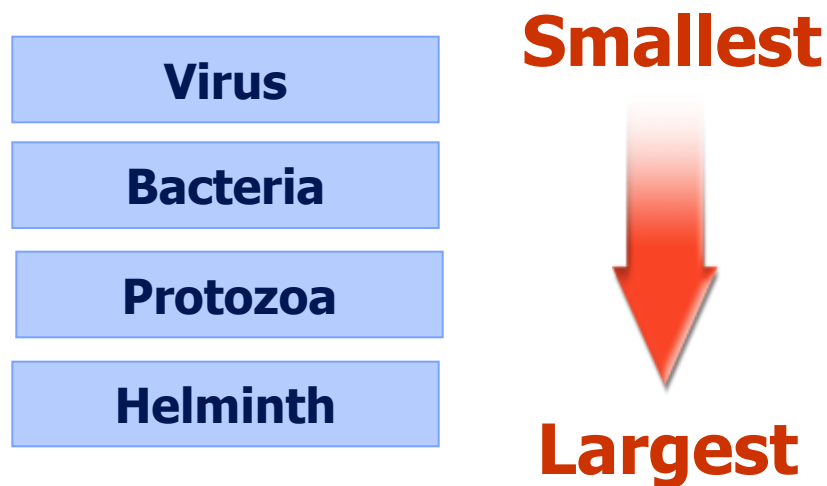
There are 4 types of pathogens:

1. *Viruses*
2. *Bacteria*
3. *Protozoa*
4. *Helminths (worms)*

# How Big Are Pathogens?

Most pathogens are too small to see with your eyes.

You can see some helminths (worms).





# Relative Size Comparison

Size of the space between sand grains in a BSF (1 micron)

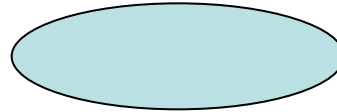


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Virus (0.02 to 0.2 micron)

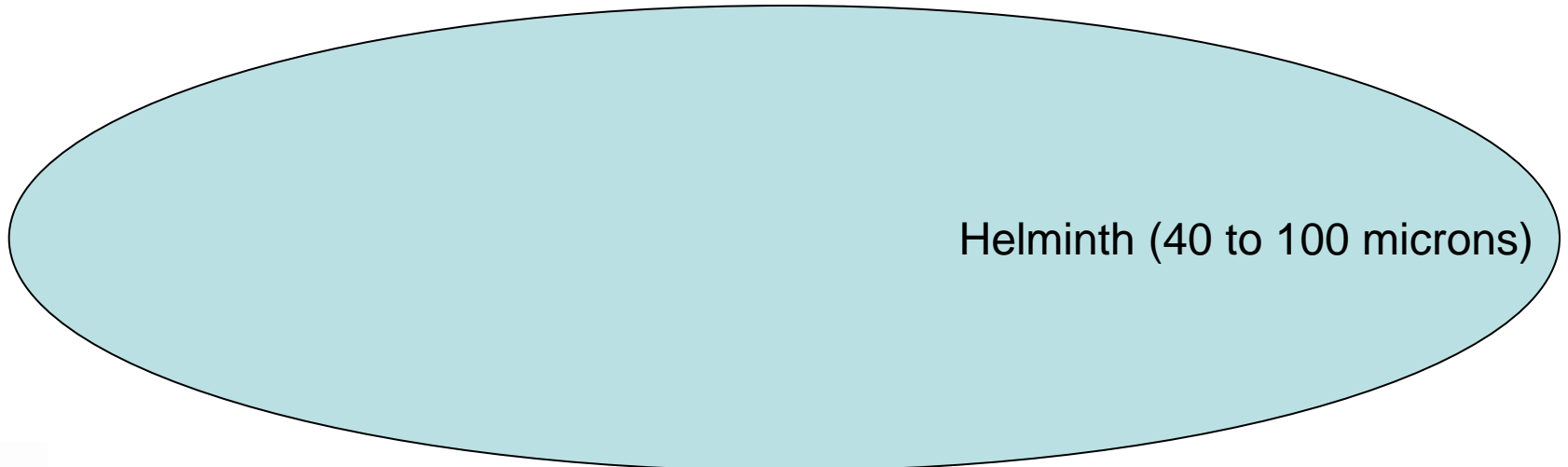


Bacteria (0.2 to 5 microns)



Protozoa (4 to 20 microns)

Note: These circles are shown much bigger than the real pathogens. This drawing only shows how big they are compared to each other. In real life, almost all of them are too small to see.

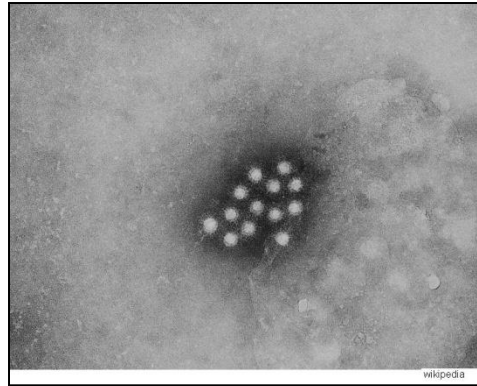


Helminth (40 to 100 microns)

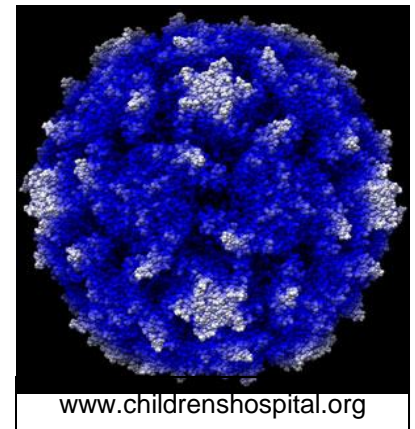
# Viruses

## Common Viruses:

- *HIV*
- *Hepatitis A and E*
- *Polio*
- *Influenza*



Hepatitis A



Polio

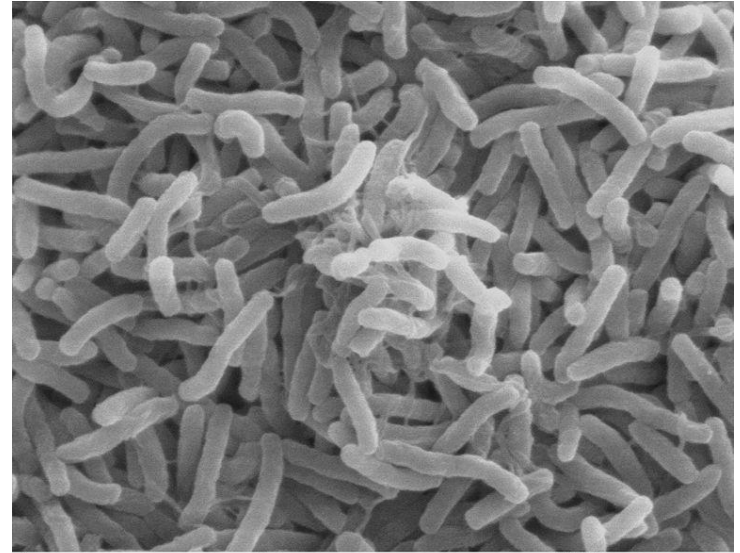
Diseases we can get from viruses in water:

*Hepatitis A & E, Polio*

# Bacteria

## Common Bacteria:

- *E. Coli*
- *Staphalococcus*
- *Salmonella*



Cholera

<http://emf.dartmouth.edu/imagesindex.html>

Diseases we can get from bacteria in water:

*Cholera, Typhoid*

# Protozoa

Common Protozoa:

- *Malaria*
- *Giardia*
- *Cryptosporidium*



Giardia



Cryptosporidium Oocyst

Diseases we can get from protozoa in water:

*Giardia*, *Cryptosporidiosis*, *Amoebic Dysentery*  
(*Entamoeba histolytica*)

# Helminths

Common Helminths:

- *Round worm*
- *Hook worm*
- *Tape worm*



Worm from a human intestine (20 feet in length)

Related diseases we can get from water:

*Schistosomiasis, Round worm*

# Review

1. What is a pathogen?

*A small living thing 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 (worms)*

# Review

Why would the biosand filter be a good technology for treating contaminated water?

- *Small pore size*
- *Removes most pathogens*



# Size Comparison

Size of the space between sand grains in a BSF (1 micron)

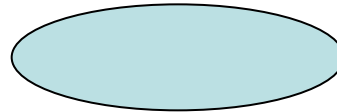


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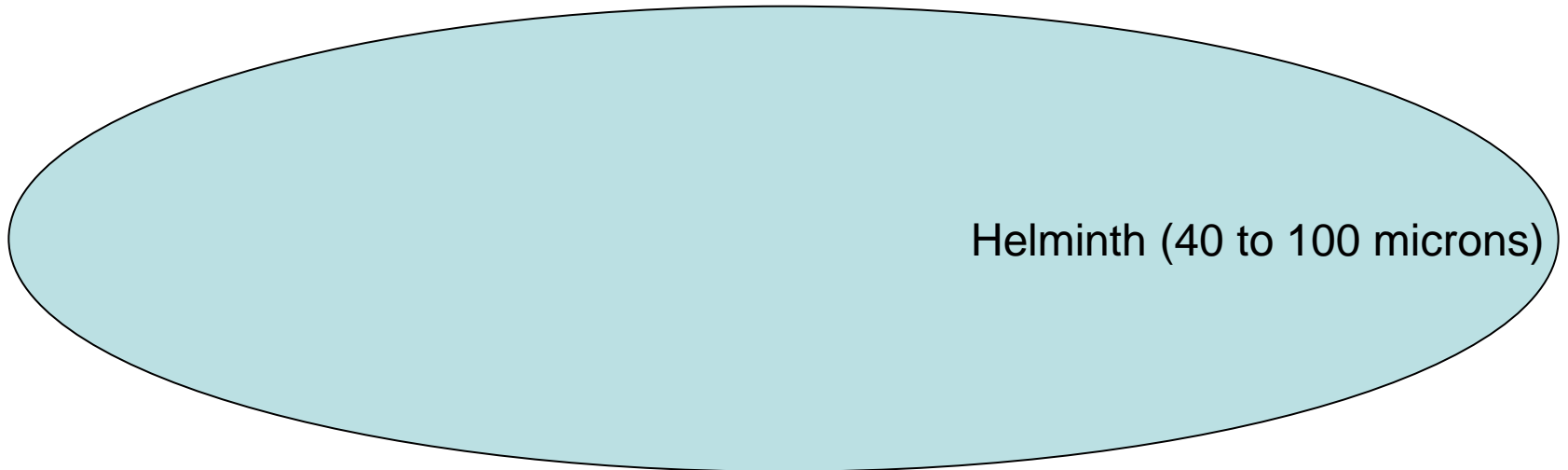
Virus (0.02 to 0.2 micron)



Bacteria (0.2 to 5 microns)



Protozoa (4 to 20 microns)



Helminth (40 to 100 microns)

# How to avoid disease

What can we do to avoid getting sick?

- *Drink only treated water*
- *Use a latrine*
- *Practice good sanitation (drainage, waste disposal, vector control)*
- *Wash hands with soap many times per day, especially before eating and after defecating*
- *Eat a variety of foods to get many nutrients*