Waterborne Diseases Go Viral

Viruses

- Many different viruses can be transmitted through contaminated water. The most frequent culprits are norovirus and rotovirus. Some other viruses that can contaminate water systems and cause illness: enterovirus, adenovirus, astrovirus, hepatitis A, hepatitis E. All of these have been isolated from wells and surface waters in North America.
- The good news is that viruses are host specific. Therefore, viruses that infect animals and plants do not usually infect humans, although a small number of enteric (intestinal) viruses have been detected in both humans and animals.
- The bad news is that some viruses (like norovirus) can survive for long periods: for weeks on hard surfaces and for months, maybe even years in contaminated water.
- Size: 0.02 to 0.04 micron – about 1/100 to 1/10 of the size of bacteria
- Infectious dose: 10 or less
- Viruses can only multiply inside a host. The virus binds to the host cell. It injects its genetic material which is then copied over and over by the host cell's protein production system. Once the components are produced, new virus particles assemble and newly produced viruses are expelled from the host cell.
- Studies have shown a 1000-fold increase in Norovirus particles in 48 to 96 hours.
- Symptoms of illness usually occur from 12 hours to 2 days after exposure and last for 2 or 3 days.
- Enteric viruses are contagious from soon after first contact until a few days or weeks after you no longer have symptoms.

"Norwalk Virus" *Norovirus*

i. Description and symptoms:

- A "positive" single-strand RNA virus first identified in 1972 during an outbreak in Norwalk, Ohio.
- Most common form of food and water borne illness worldwide.
- Symptoms include nausea, vomiting, diarrhea, and stomach cramps and can also include low-grade fever, chills, headache, muscle aches, and fatigue.
- Immunity to norovirus is short-lived – about 3 months.

ii. Treatment

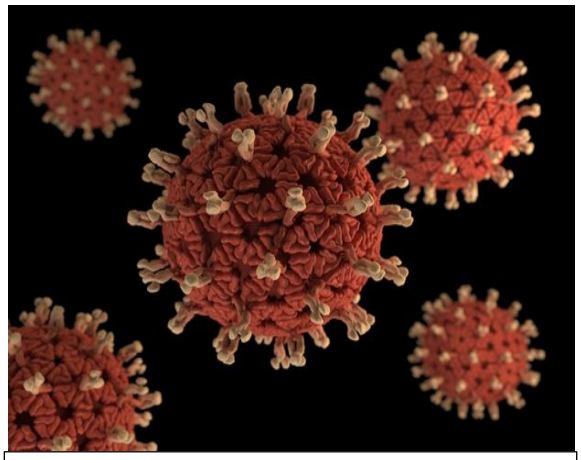
- Treatment: rest and plenty of fluids to prevent dehydration.
- STAY HOME. Norovirus is very contagious.
- Complications other than severe dehydration are rare.
- Antibiotics are not effective against viruses.

http://www.cuhk.edu.hk/med/mic/Education/SeminarFiles/2017/Kirs

Prepared for Pete's Lake Water Users' Society
by Trudi Smith BSc MSc (Food Science, UBC)
March/April 2019

"Stomach Flu" *Rotavirus*

i. ***Description and symptoms:***



http://outbreaknewstoday.com/human-rotavirus-manipulates-immune-response-maintain-infection-30004/

- A double-strand RNA virus, first identified in 1973. It is historically and currently the major cause of infant mortality from severe dehydration globally, causing about 450,000 deaths of children under age 5 each year.
- A person's first infection with rotavirus usually causes severe illness. Each exposure to the disease builds immunity. Later infections produce milder or no visible symptoms, but the infected person can still pass the virus to others.
- Vaccine is now available for infants: 3 doses given by mouth at 2, 4 and 6 months.
- Symptoms similar to Norovirus, but severe on first contact with the virus.

ii. ***Treatment:*** Same as for Norovirus.

Summary table for Waterborne Disease examples:

Organism	Size	Treatable with antibiotics?	Complications?
Parasites			
Giardia	8-14 microns	Yes	Long term intestinal issues
Cryptosporidium	4-6 microns	No	Damage to liver, pancreas, bladder, lungs The disease can be irreversible, leading to death
Bacteria			
Campylobacter	0.2x0.5 to 0.5x5 microns	Not advised	Irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), reactive arthritis, Guillain-Barré Syndrome (paralysis)
E. coli	0.5x2 microns	Not advised	Blood loss, long-term kidney dysfunction, seizures, diabetes, chronic intestinal problems and high blood pressure.
Viruses			
Norovirus	0.02-0.04 micron	No	Severe dehydration. Very contagious.
Rotavirus	~0.05 micron	No	

Next up:
Drinking Water Safety Part 5: Pete's Lake Water System

Prepared for Pete's Lake Water Users' Society
by Trudi Smith BSc MSc (Food Science, UBC)
March/April 2019