

A dynamic splash of clear blue water against a white background, with a thick blue wave-like shape at the bottom of the page.

# Water Treatment for Coronavirus

*July 22, 2020*  
*Board Meeting*



# Historical Perspective

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*Waterborne Disease*



**GLWA**

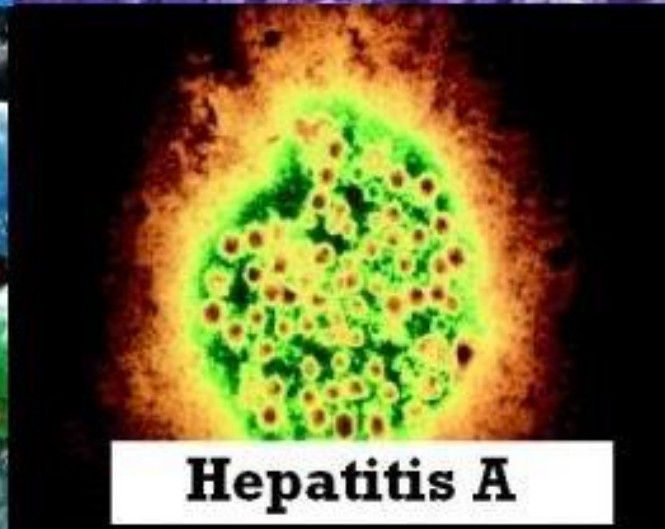
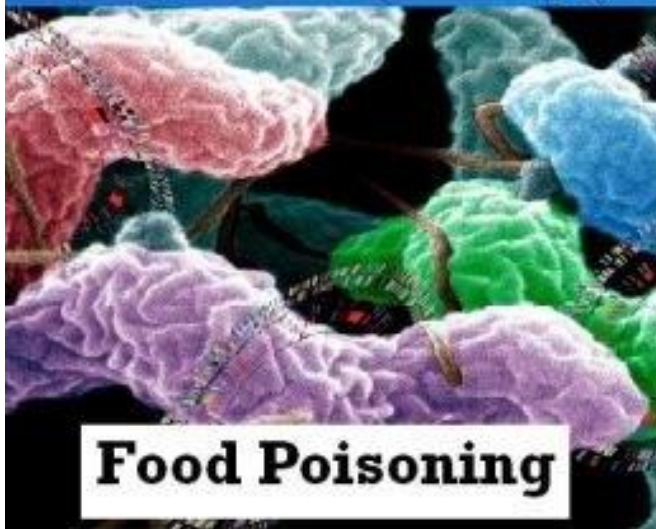
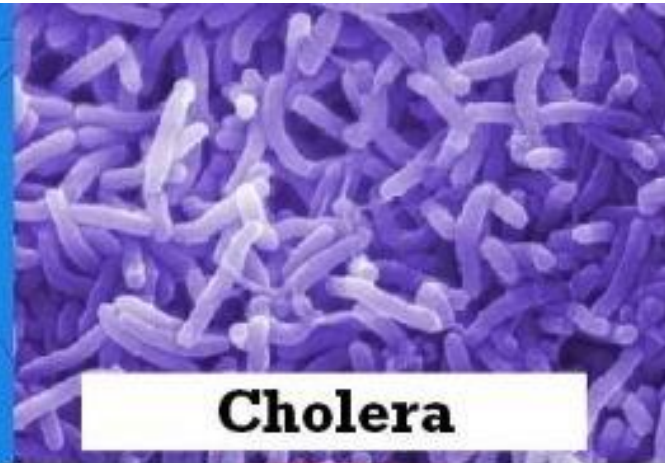
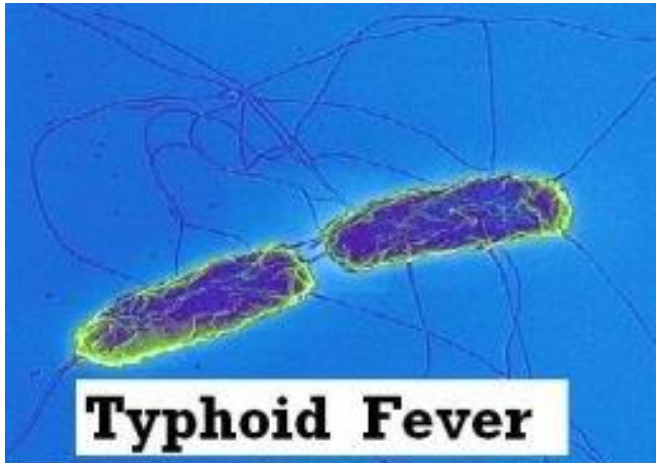
*Great Lakes Water Authority*

# Water - Primary Reason for Settlement





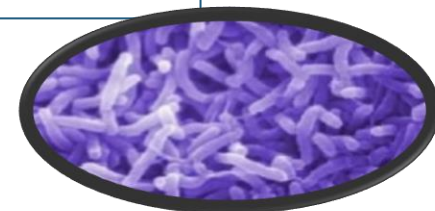
# Bacteria, Protozoa and Viruses



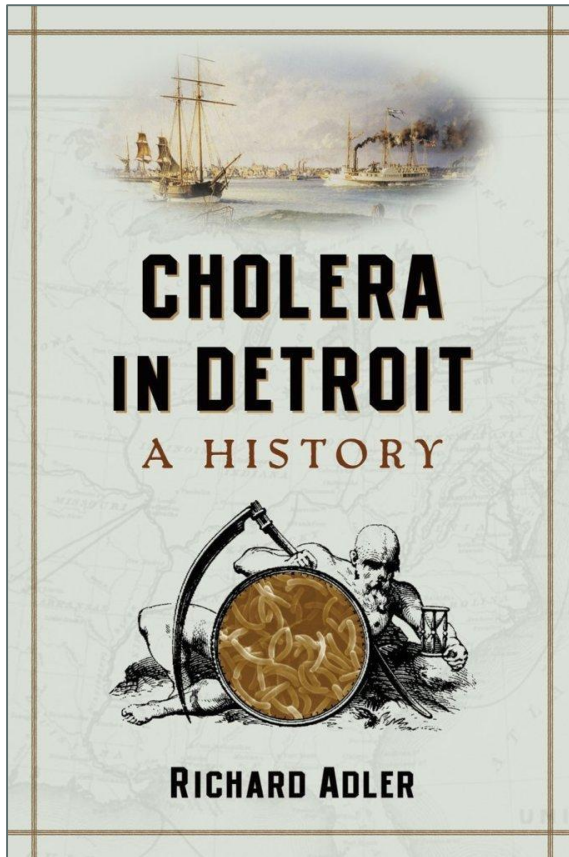
# Diseases Caused by Bacteria, Protozoa and Viruses



Organism	Disease Caused	
Salmonella Typhi	Typhoid Fever	Bacteria
Legionella	Legionnaires'	Bacteria
Vibrio cholerae	Cholera	Bacteria
Cryptosporidium parvum	Cryptosporidiosis	Protozoa
Giardia lamblia	Giardiasis	Protozoa
Hepatitis A Virus	Hep A	Virus
Norwalk	Gastroenterities	Virus

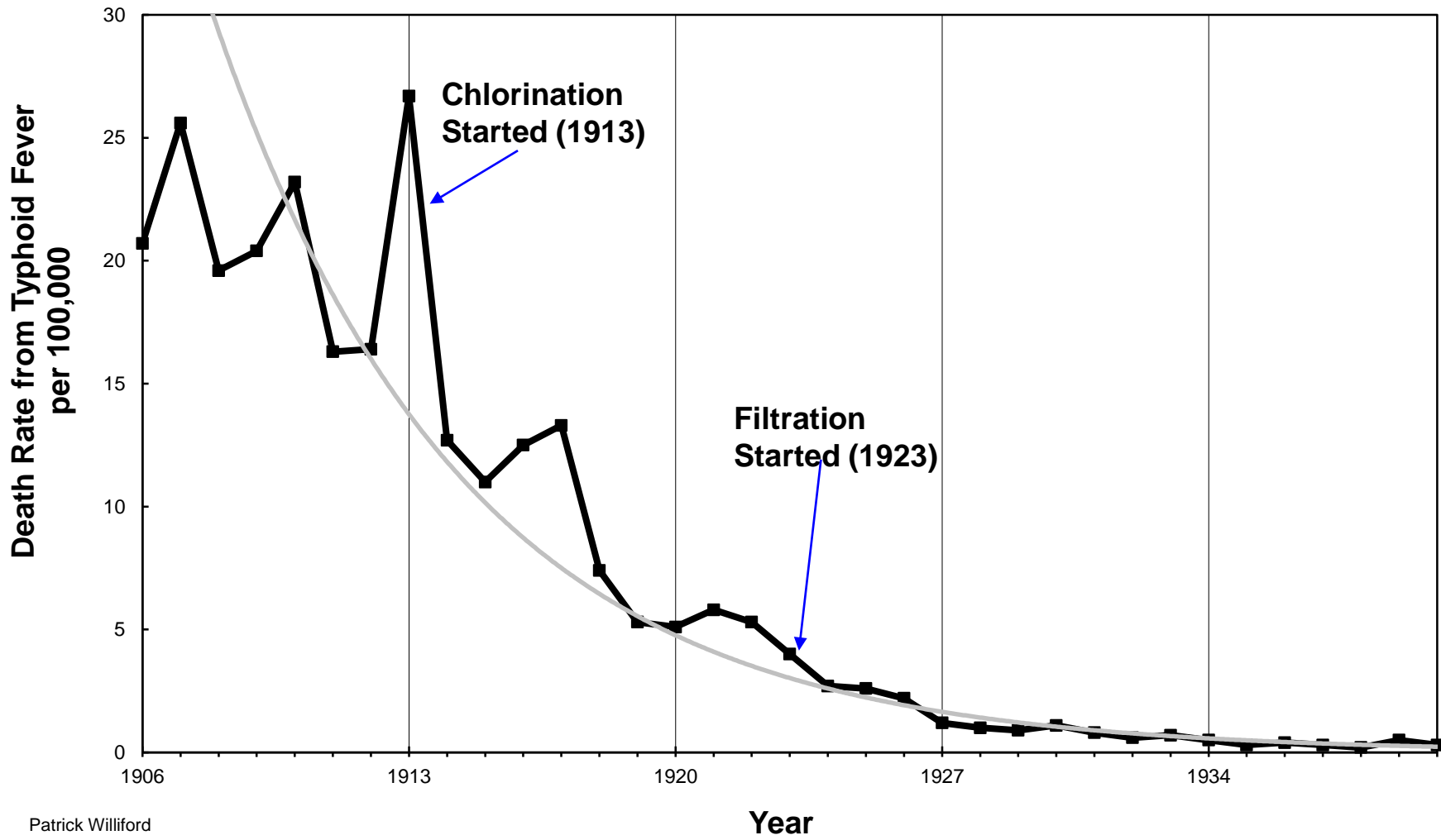


# Typhoid and Cholera Epidemics



Death's Dispensary (1866)

# Detroit Benefits from Chlorination and Filtration of Drinking Water



# GLWA Water Treatment

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*Unquestionable Quality  
Delivered*



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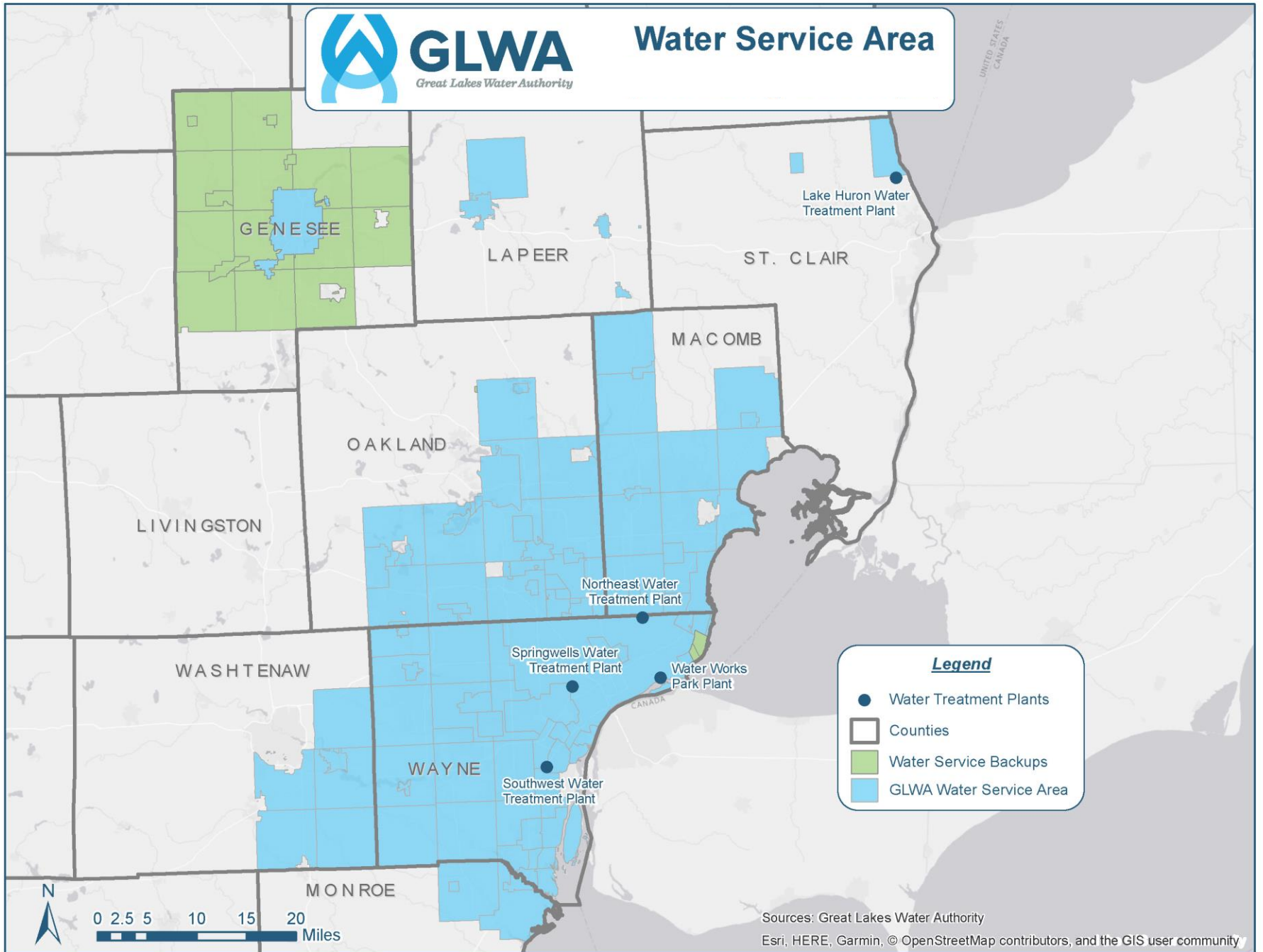
# DRINK IT IN





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# Water Service Area



**Legend**

- Water Treatment Plants
- Counties
- Water Service Backups
- GLWA Water Service Area

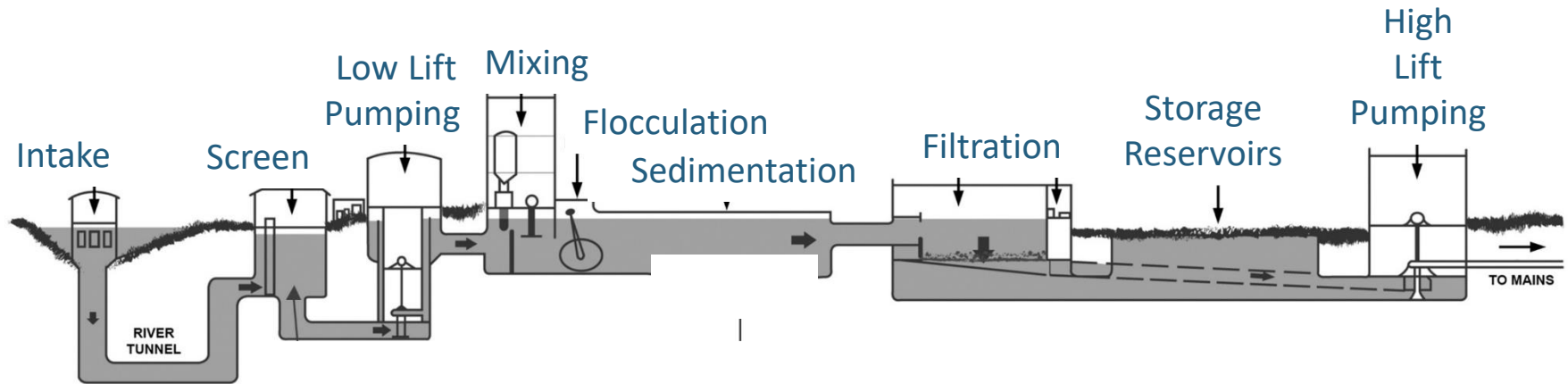


Sources: Great Lakes Water Authority  
Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community



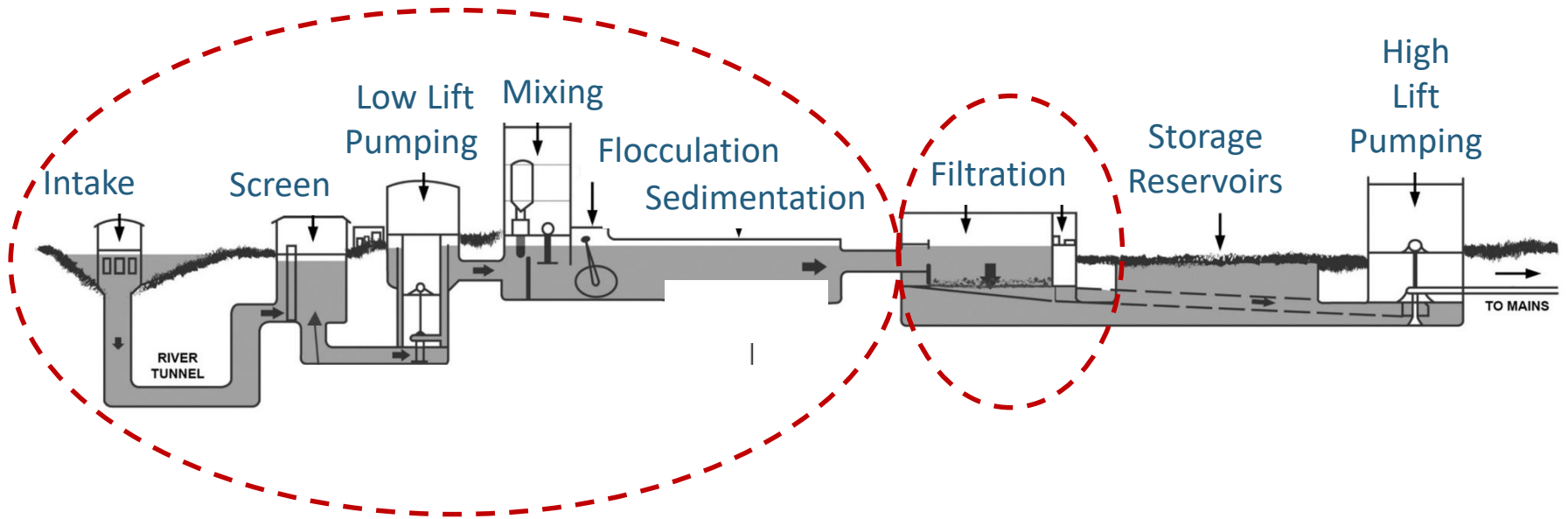
# Our Five Water Treatment Plants

# Conventional Water Treatment





# Conventional Water Treatment

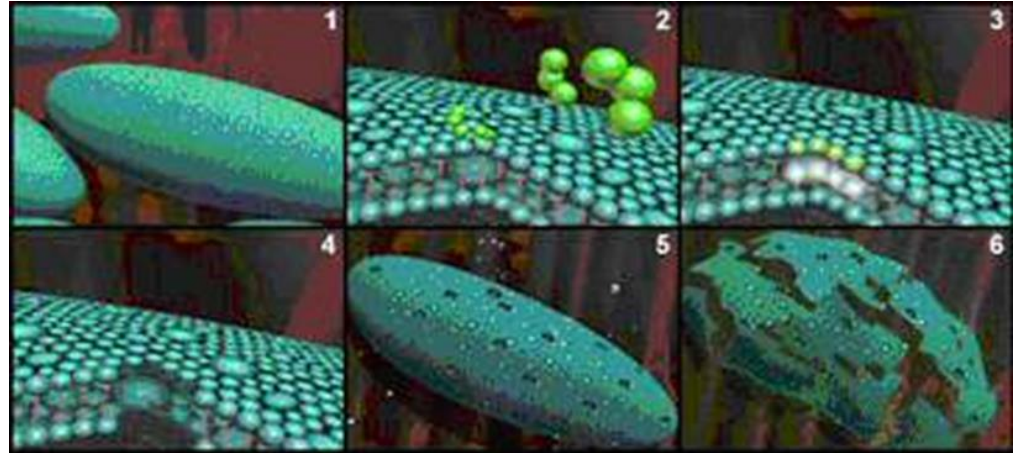


Pretreatment  
including  
Disinfection

Filtration

# Disinfection

Water Treatment Plants protect public health, their primary weapon is disinfection



Oxidation of bacteria

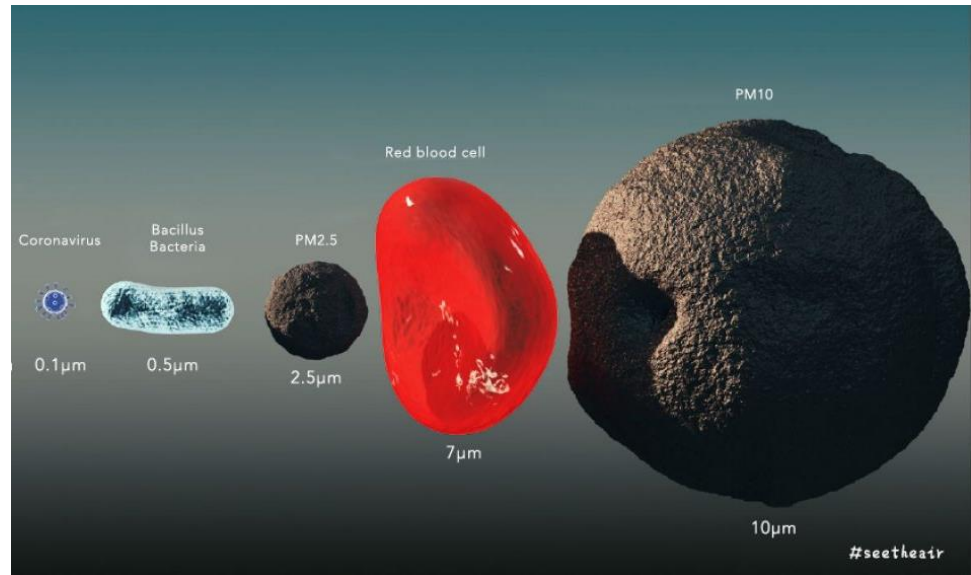
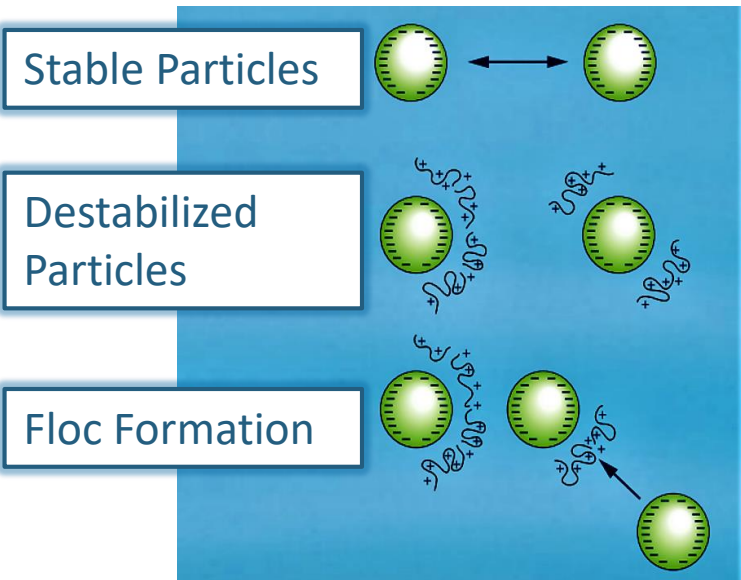
## Chlorine Disinfection Time Required\*

<i>E. coli</i> 0157 H7 bacterium	< 1 minute
<i>Hepatitis A virus</i>	about 16 minutes
<i>Giardia parasite</i>	about 45 minutes
<i>Cryptosporidium</i>	6 - 7 days



# Coagulation

*Chemical Coagulation causes flocs to form. Floc is comprised of chemical precipitates that enmesh smaller particles like viruses and bacteria.*

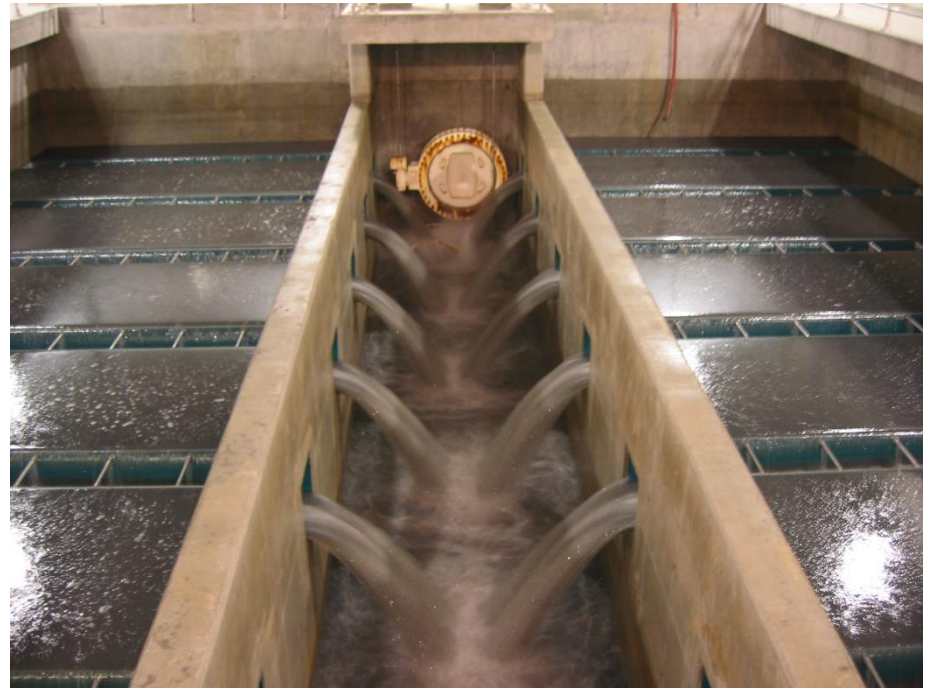


How big is a Coronavirus?



# Filtration

*The heart and soul  
of a water treatment plant*



Filter Backwash

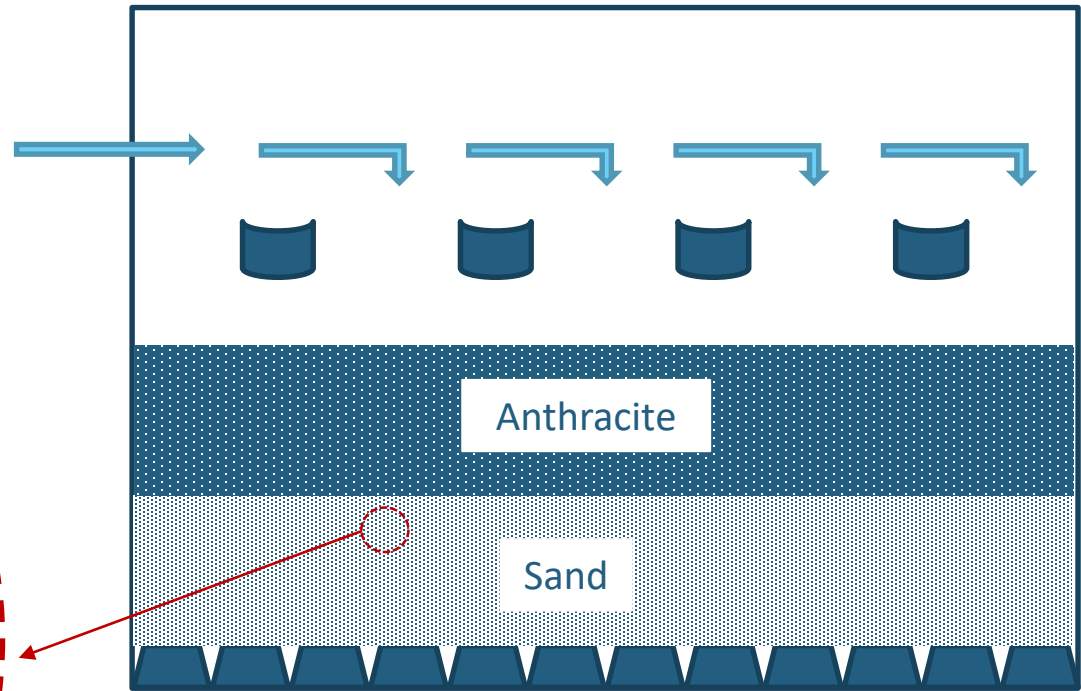
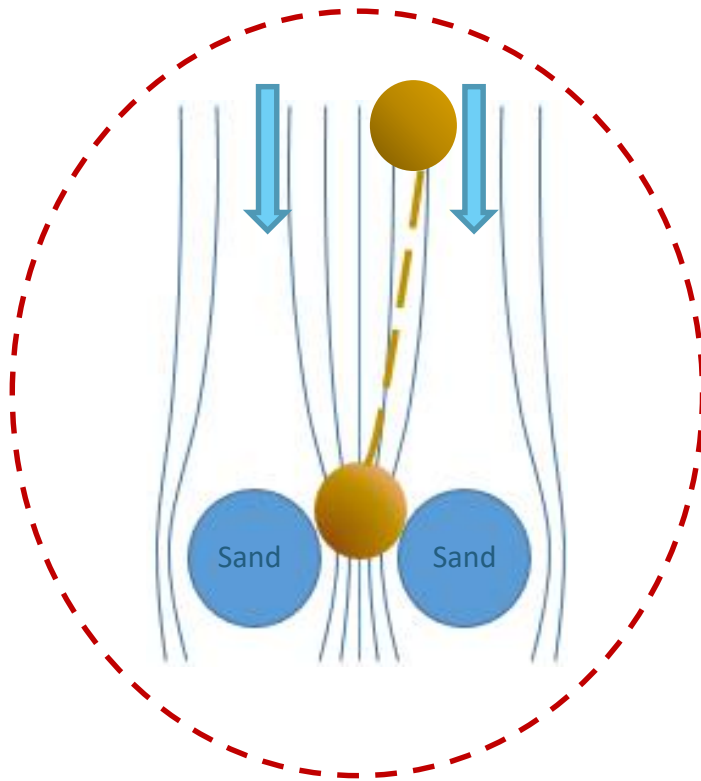


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# Filtration

*Separation of Particles from Water using a bed of media*

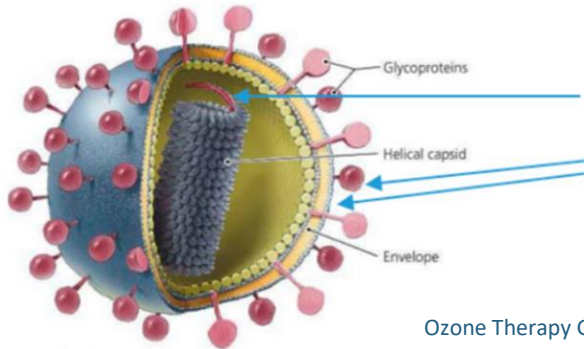
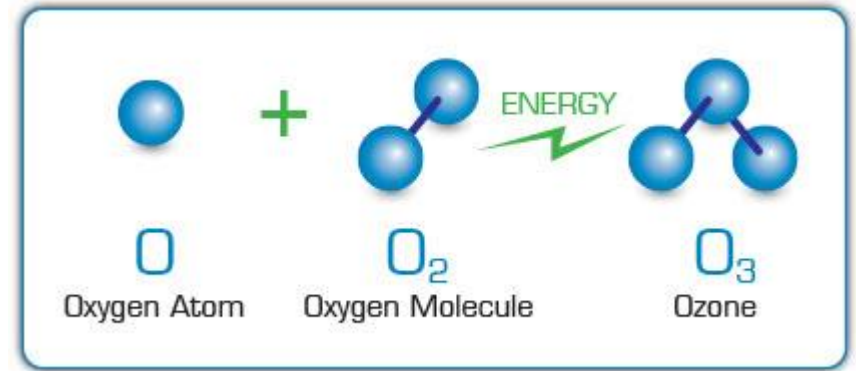


Filter Section



# Ozonation

*Ozone destroys viruses by diffusing through the protein coat into the nucleic acid core, resulting in damage of the viral RNA.*



Ozone acts by:

Direct interaction with RNA

Modification of structural components: lipoproteins and lipids.

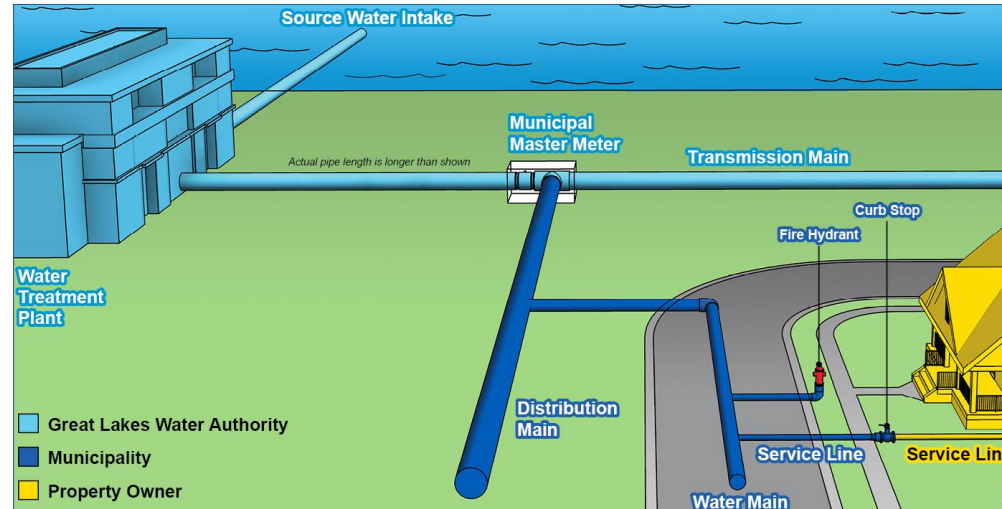
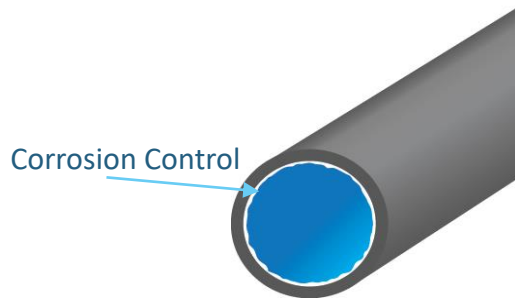
Ozone Therapy Global Journal, Vol. 9, n 1 pp. 33-60, 2019

[www.rovingblue.com/ozone-facts/](http://www.rovingblue.com/ozone-facts/)



# Distribution System

Regulations require the chlorine dose residual to protect water throughout the transmission system to all Member Partners.



*The benefits of GLWA chlorine residual:*

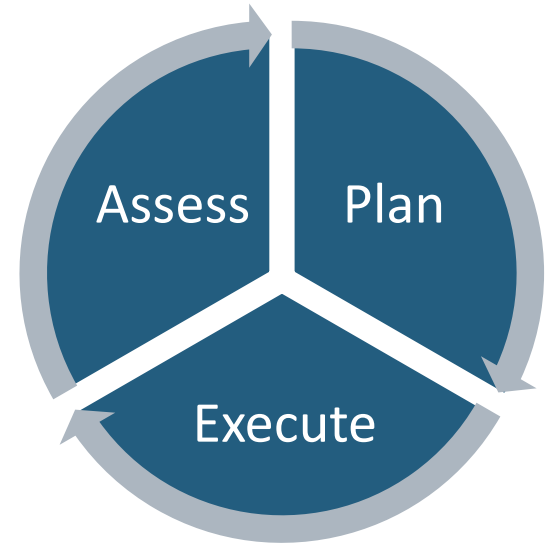
- ◆ Meets and exceeds regulatory requirements
- ◆ Beneficial impacts on Corrosion Control
- ◆ Protects against waterborne disease like Legionnaires.



# Disinfection for the Future

## GLWA's Capital Improvements Program Goals

- *Increase resiliency*
  - *Adhere to long term planning recommendations*
  - *Best-in-class planning*
- ◆ *Capital investments require data-driven decisions.*
  - ◆ *Upcoming Water Master Plan will examine other options for disinfection; this includes ozonation at additional plants*
  - ◆ *Changes require study of unintended consequences*
  - ◆ **Stable** *water quality characteristics, including chemical feeds, provide benefits during transmission*

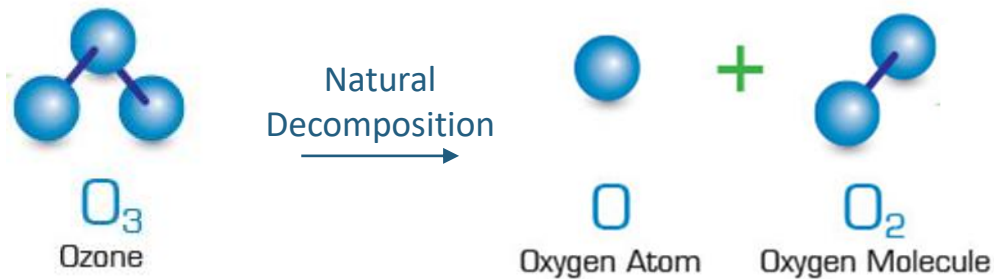


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# Ozonation vs. Chlorination

Ozone	Chlorine
No Long-Term Residual	Protective Residual for Transmission
High Energy and Maintenance Costs	Chemical Transport Concerns
Strong Oxidizer can reduce Taste and Odor Issues	Oxidizer requiring safety precautions



# Coronavirus is a Virus

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*Our treatment was up to  
the task*



**GLWA**

*Great Lakes Water Authority*

# Center for Disease Control

“The COVID-19 virus has not been detected in drinking water. Conventional water treatment methods that use filtration and disinfection, such as those in most municipal drinking water systems, should remove or inactivate the virus that causes COVID-19.”



# US Environmental Protection Agency

“EPA’s drinking water regulations require treatment at public water systems to remove or kill pathogens, including viruses.”

“EPA’s recommends Americans continue to use and drink tap water as usual.”



<https://www.epa.gov/coronavirus/drinking-tap-water-safe>



# World Health Organization

“Presence of the COVID-19 virus has not been detected in drinking-water supplies and based on current evidence the risk to water supplies is low.”

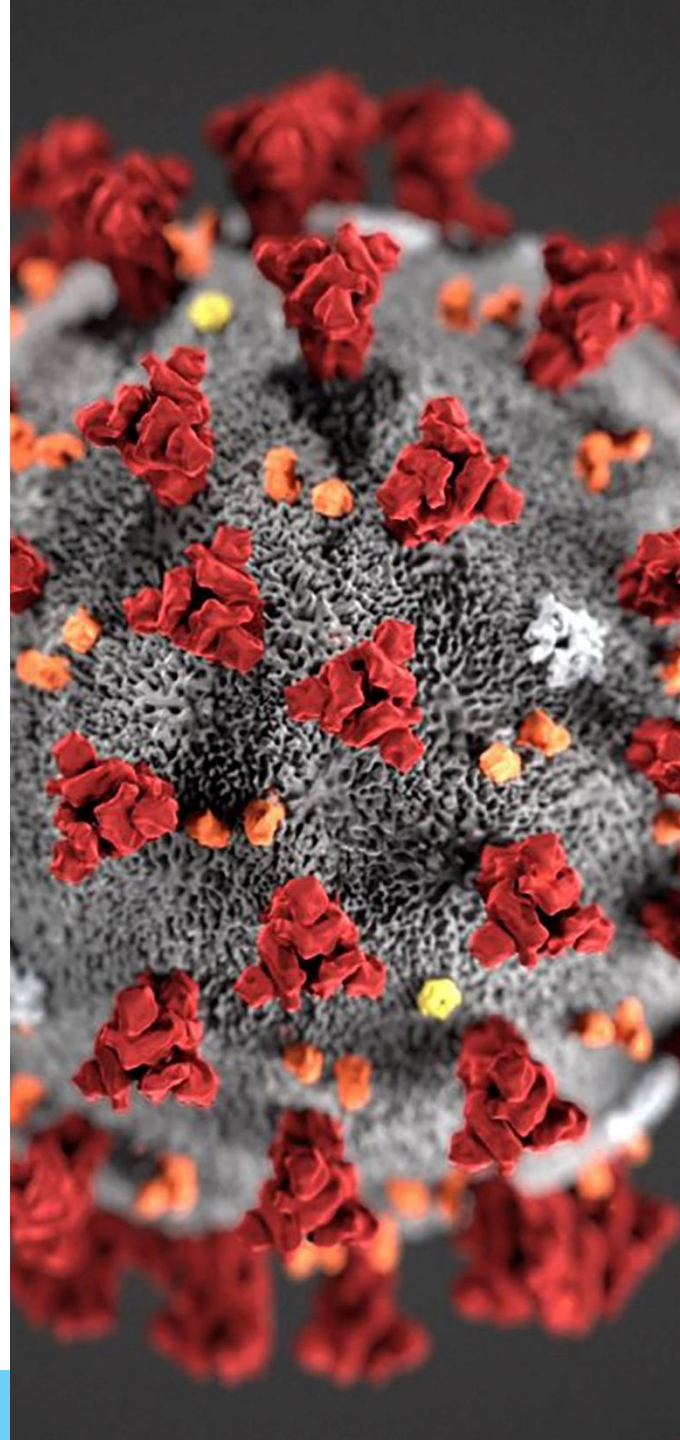
<https://www.who.int/publications-detail/water-sanitation-hygiene-and-waste-management-for-covid-19>.



# Coronavirus Facts

*Two Main Routes of Transmission:  
Respiratory and Contact*

- 1. Chlorination is effective against the COVID-19 lipid host cell membrane**
- 2. Chlorine oxidizes and destroys virus proteins and genetic material**
- 3. WHO Recommended Contact Time:  
0.5 mg/L TCR for 30 minutes**
- 4. GLWA CT consistently exceeds the WHO's recommended standards.**



# Questions

