

Assessment of Water Treatment Devices

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Point-of-Use Laboratory has evaluated hundreds of Water Treatment Devices

To assess New Technologies for Water and Wastewater Treatment

A Village where every building is a Laboratory designed to assess Water Technology



Point of Use & Microbiology Laboratory

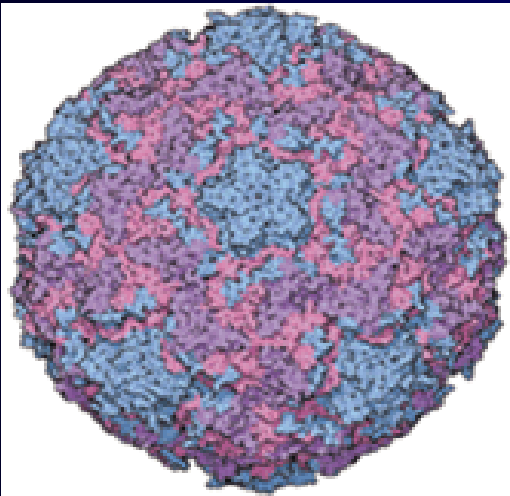


Microbiological Water Purifier

- A device or chemical that is capable of making water free from waterborne microorganisms
- “Drinking water should be treated to reduce the risk of waterborne illness to less than 1:10,000 per year.” (United States Environmental Protection Agency)

Types of Water borne/based Pathogens

Viruses



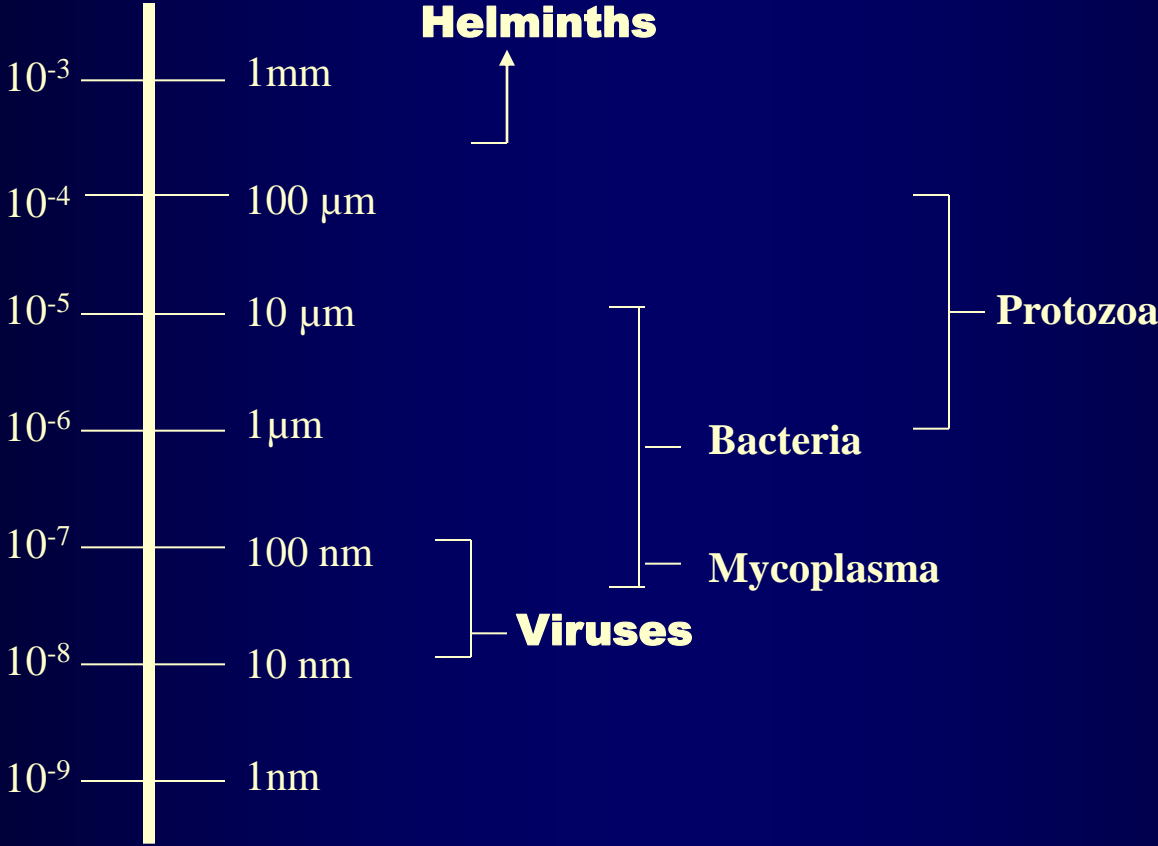
Bacteria



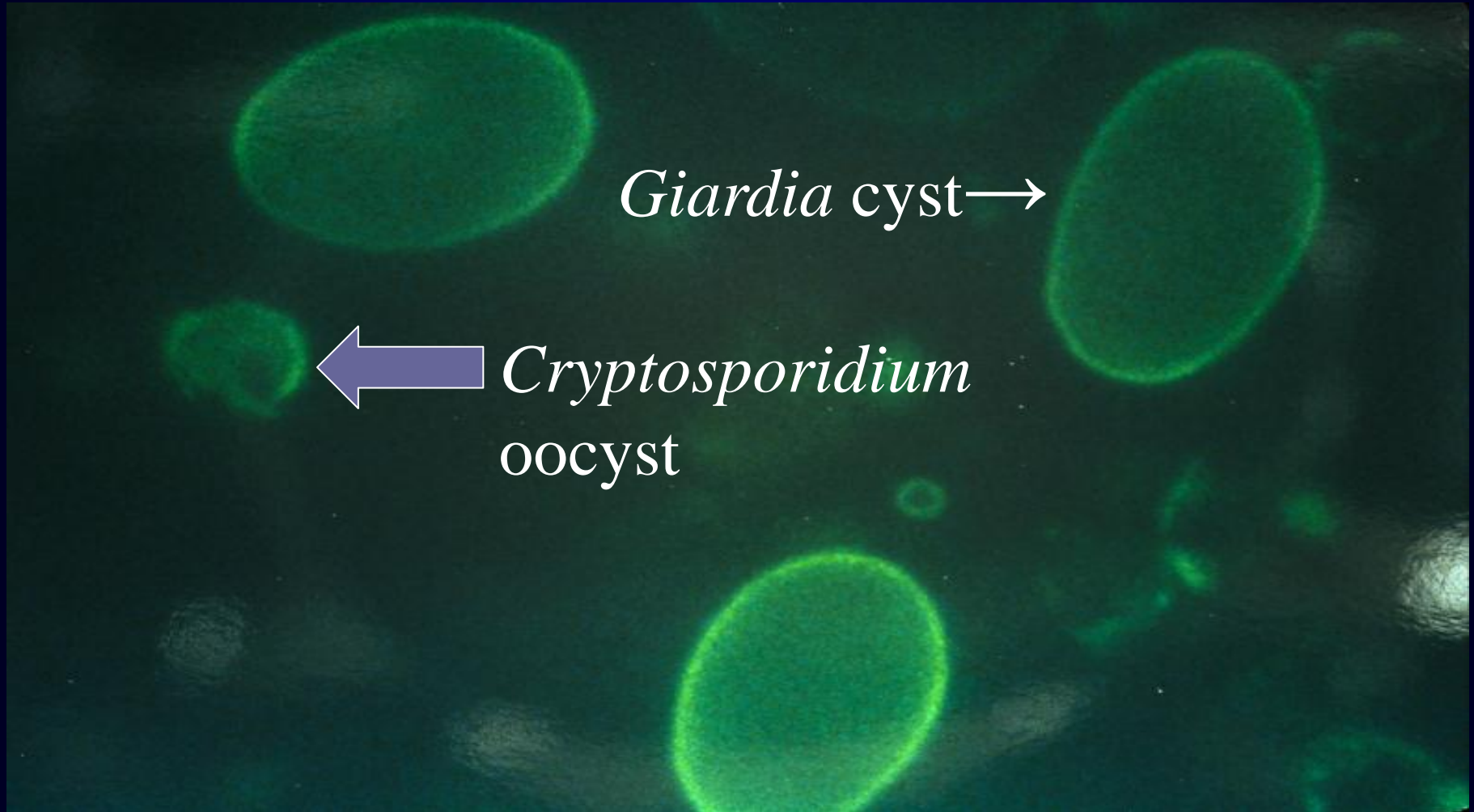
Parasites



Sizes of Microorganisms



Giardia cysts (8-12 μm) and
Cryptosporidium oocysts (4-6 μm)



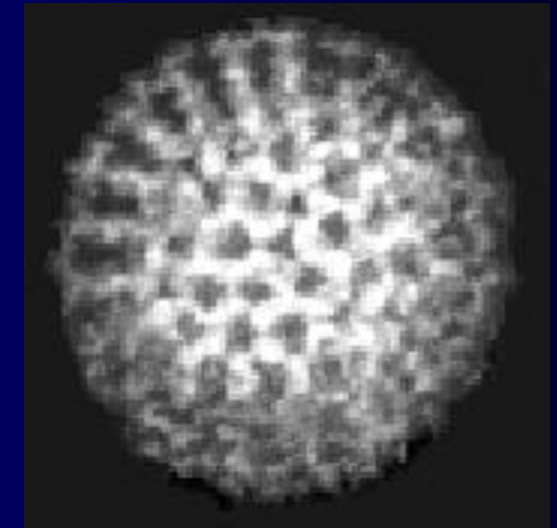
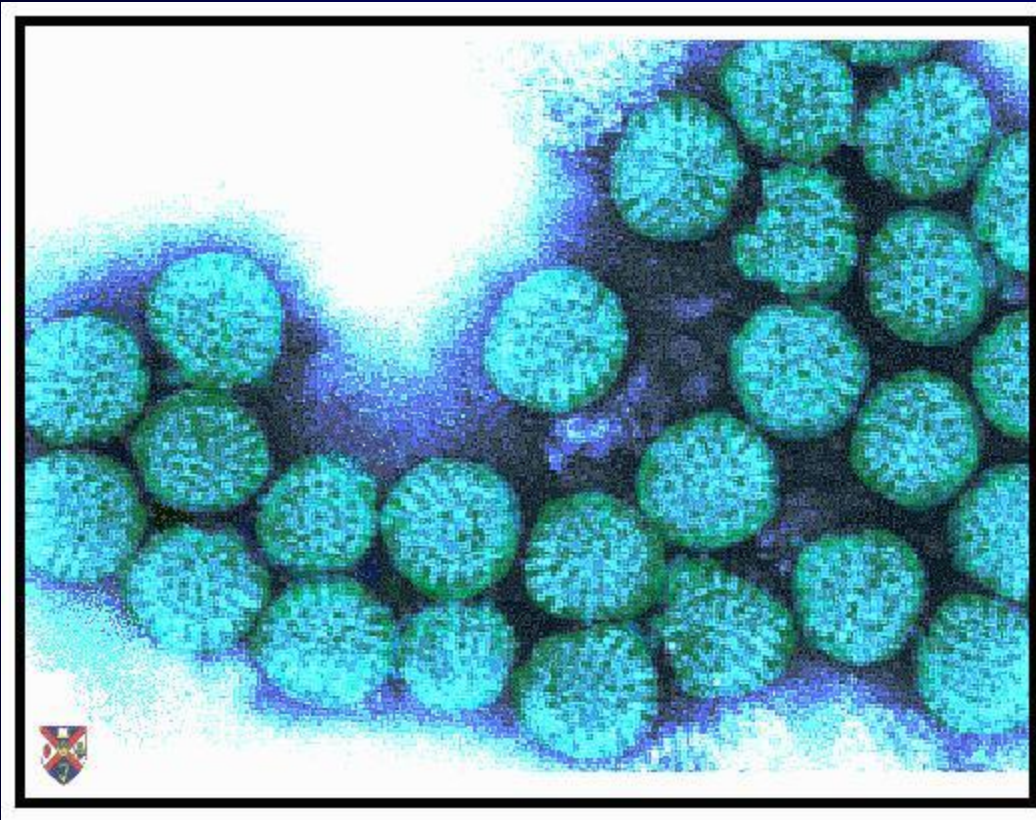
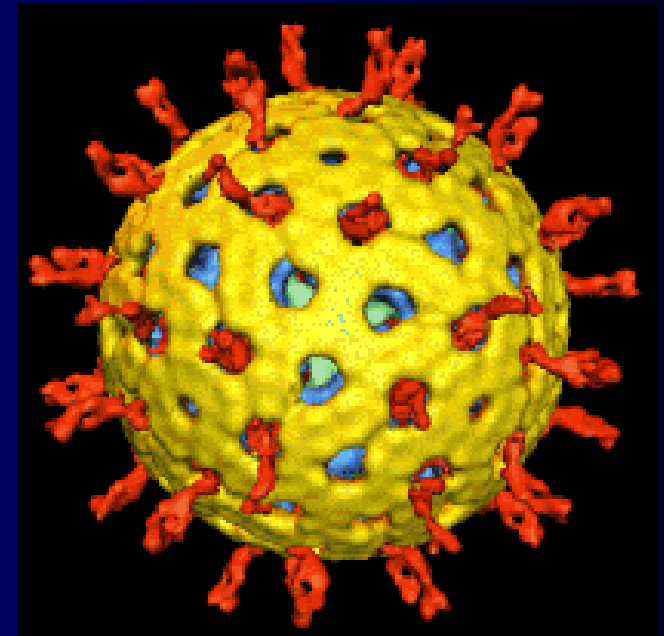
(Cryptosporidium parvum)
**Most Chlorine Resistant
waterborne microbe known**



Campylobacter spp.

- Most common cause of bacterial diarrhea in animals and humans
- Excreted by wide birds and poultry
- Can be expected to occur in all types of surface waters

Rotavirus – Major cause of childhood diarrhea world wide (~70 nm)



**How do we ensure that water
has been adequately treated**



Testing Requirements

**Guide Standard and Protocol
For Microbiological Water
Purifiers**

NSF Protocol P231



Guide Standard and Protocol for Microbiological Water Purifiers



Required test organisms

Log ₁₀ reduction* required: bacteria	Log ₁₀ reduction* required: viruses	Log ₁₀ reduction* required: protozoa
≥ 6	≥ 4	≥ 3
<i>Klebsiella terrigena</i>	Poliovirus Type 1 Rotavirus SA-11	<i>Cryptosporidium parvum</i>

Evaluating household water treatment options: health-based targets and performance specifications (WHO, 2011)

Rating	Log ₁₀ reduction* required: bacteria	Log ₁₀ reduction* required: viruses	Log ₁₀ reduction* required: protozoa
<p><i>Highly protective.</i> Achieves WHO-recommended risk-based target of 10⁻⁶ DALYs per person/year.</p>	≥ 4	≥ 5	≥ 4
<p><i>Protective.</i> Achieves intermediate risk-based target of 10⁻⁴ DALYs per person/year, representing improved water quality.</p>	≥ 2	≥ 3	≥ 2

Suggested Test Organisms



World Health Organization

OR

bacteria	viruses	: protozoa
<i>Campylobacter jejuni</i>	Rotavirus	<i>Cryptosporidium parvum</i>
<i>Escherichia coli</i>	MS-2 Coliphage	<i>Clostridium perfringens</i> spores

Must Work under a variety of Water Quality Types

-Turbidity
(60 NTU)

-Temperature
(4 °C) (for
halogens)

-pH (for
halogens)

-High dissolved
solids



Performance



- Must be tested and perform throughout the lifetime of the device (ie.e if unit is designed for 18,000 liters it must be tested for 18,000 liters)



We have been testing the Family Lifestraw® Unit for more than three years under a variety of water quality conditions

Laboratory Test Stand

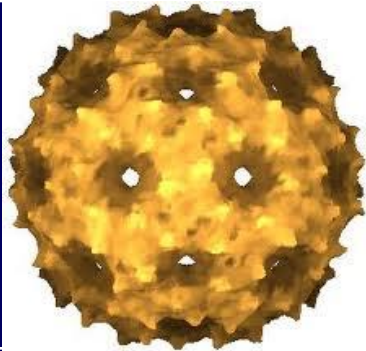

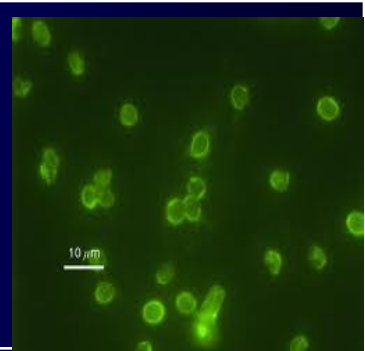


Greater Than

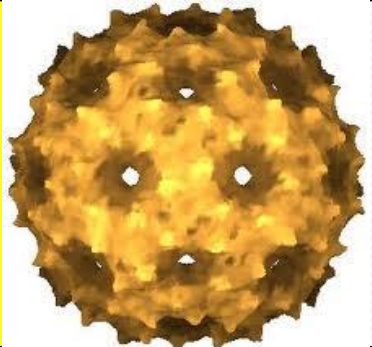

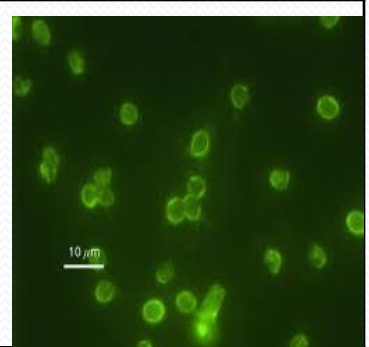
- **If all the test organisms are removed below the detection limit the % or Log removal is reported as greater than or**



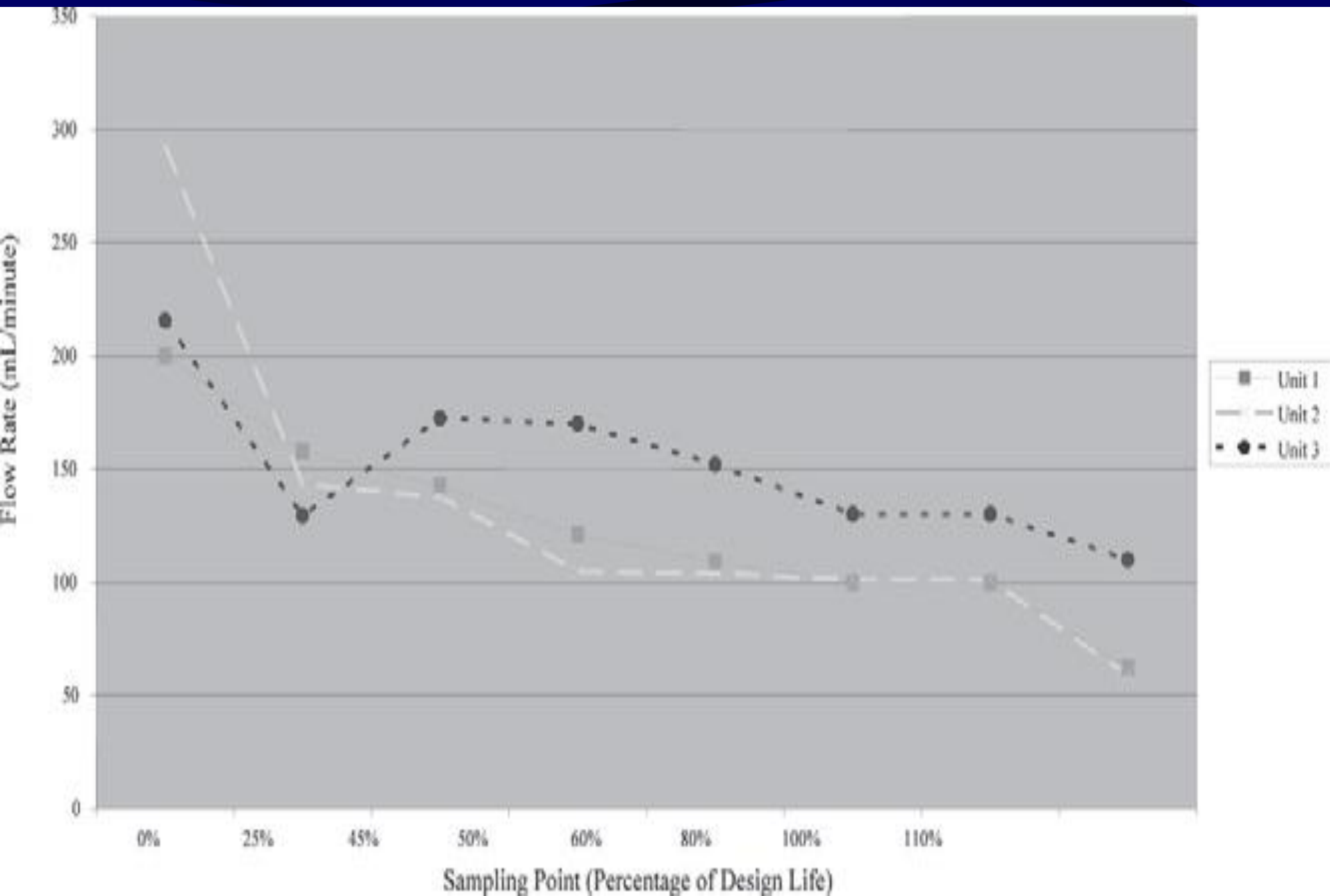
Summary of Reduction Values for Test Organisms

			
Organism	MS2 Virus (23 nm)	<i>E. coli</i> (0.5 micron)	<i>Cryptosporidium parvum</i> (4-6 microns)
Liters of Water of Water Processed	18,000	18,000	18,000
Log Reduction	>6.8	>7.6	>4.0
Mean retention efficiency (%)	> 99.9999	> 99.99999	> 99.99

Summary of Reduction Values for Test Organisms

<p>Accelerated Aging</p>			
<p>Organism</p>	<p>MS2 Virus (23 nm)</p>	<p><i>E. coli</i> (0.5 micron)</p>	<p><i>Cryptosporidium parvum</i> (4-6 microns)</p>
<p>Volume of Water Processed</p>	<p>900L 300 NTU</p>	<p>900L 300 NTU</p>	<p>900L 300 NTU</p>
<p>Log Reduction</p>	<p>>5.4</p>	<p>>6.65</p>	<p>>4.1</p>

Change in Flow Rate over 20,000 liters of Operation





Microbiological Water Purifier