
Preventing Waterborne Disease

Professor Kristen Jellison

BioS 010

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Waterborne Disease – Global Statistics

- *1.1 billion people* lack access to improved water supply
- *2.6 billion people* lack access to improved sanitation
- Between *1.085 to 2.187 million deaths* each year due to diarrheal diseases can be attributed to the ‘water, sanitation, and hygiene’ risk factor
 - 90% of these deaths are among children under age 5



zoom in zoom out

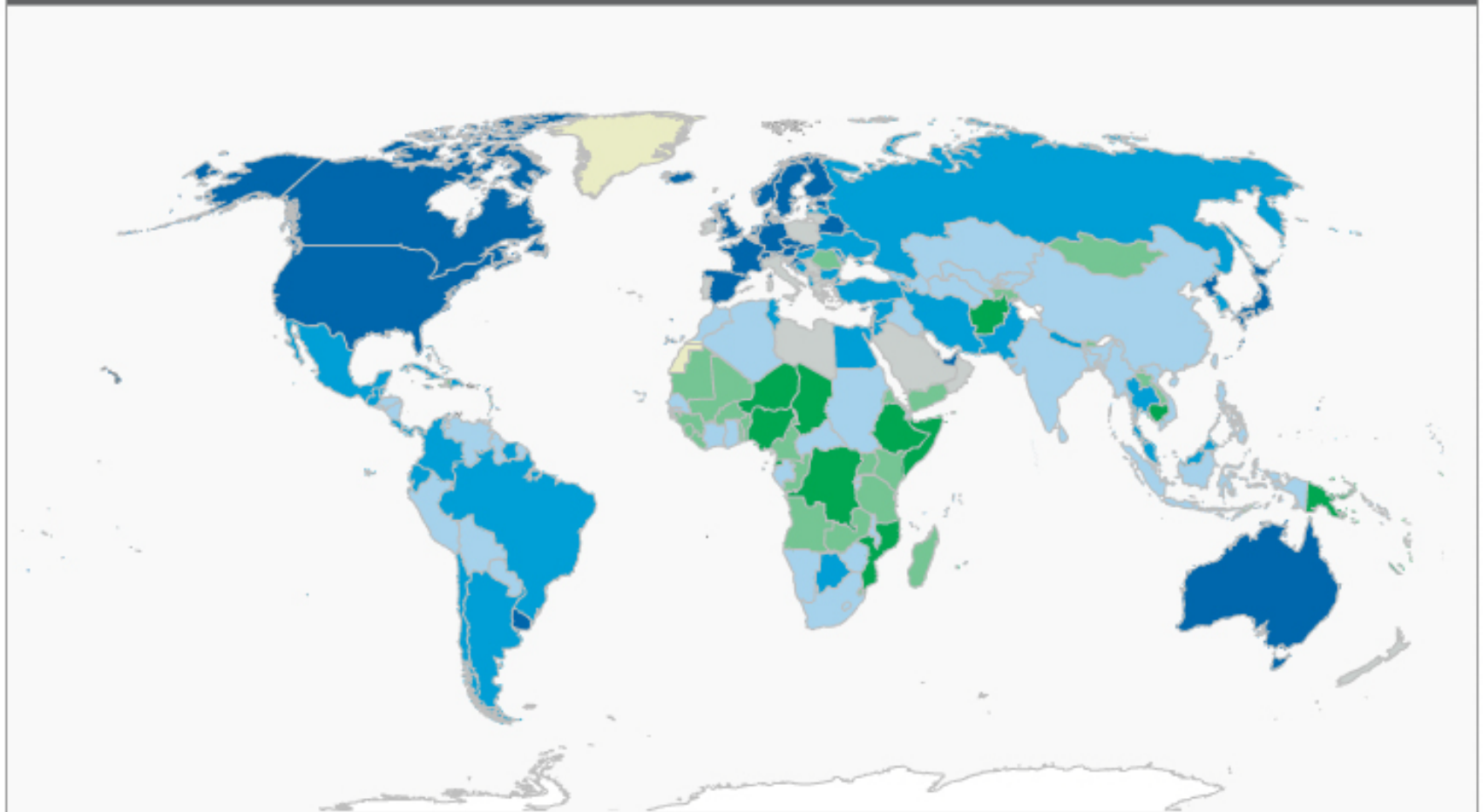
1990

2004

STEP 3.
SELECT YEAR

LEGEND Proportion of the population using improved drinking water sources, total

100% 90% - 99% 70% - 89% 50% - 69% Less than 50% No data



* disclaimer

Burden of Waterborne Disease

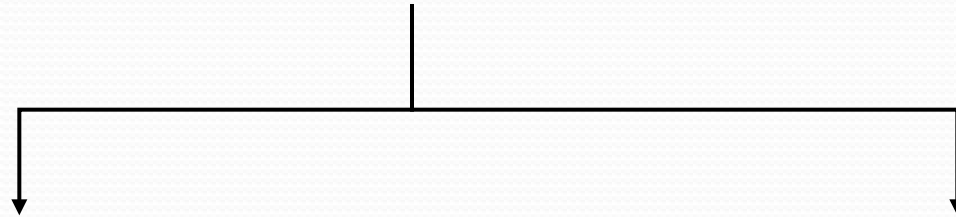
- Water-related disease is the 2nd biggest killer of children worldwide (1st = acute respiratory infections)
- At any one time:
 - half of the world's hospital beds are occupied by patients suffering from water-related diseases (WaterAid, 2008)
 - half of the population of the developing world is suffering from one or more diseases associated with inadequate water and sanitation (WaterAid, 2008)

Burden of Waterborne Disease

- 443 million school days lost annually to water-related diseases
- United Nations Millennium Development Goal (2000)
 - to reduce by half the proportion of people without access to safe water and sanitation by 2015
 - An extra \$10 billion needed each year to reach the goal (this is about *half* of what rich countries spend on mineral water)

Jellison Lab Research

Ultimate goal: Prevention of waterborne disease



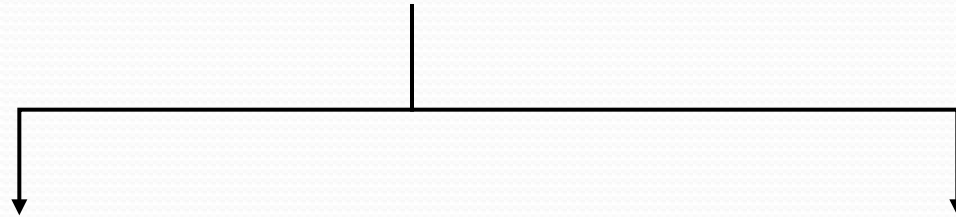
Water treatment technologies
(emphasis on developing countries)

- Ceramic filtration*
- Biosand filtration*

Watershed management
-*Parasite fate and transport*

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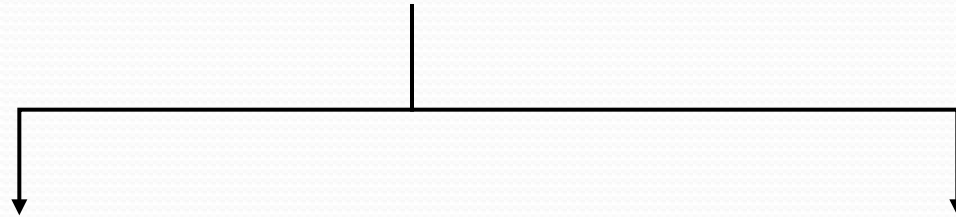
Ceramic Filtration

- Potters for Peace filter
 - 2 separate parts: (i) ceramic pot and (ii) plastic container that the pot sits inside
 - Ceramic pot has colloidal silver coating (germicide)
 - Ceramic has very small pores which entrap contaminants as water passes through



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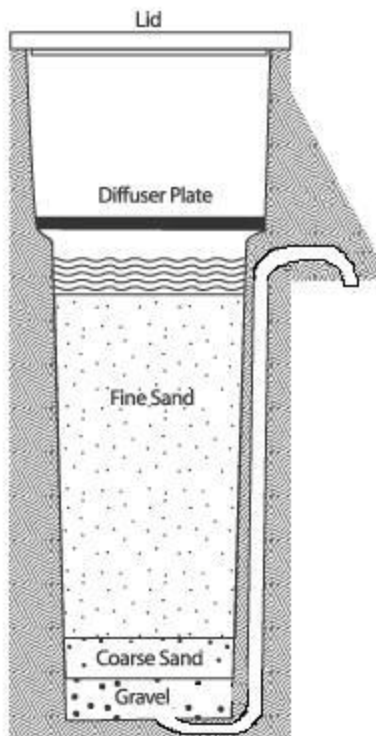
-*Ceramic filtration*

-*Biosand filtration*

Watershed management

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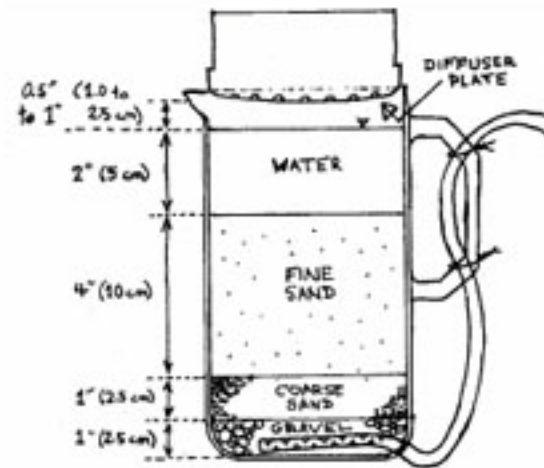
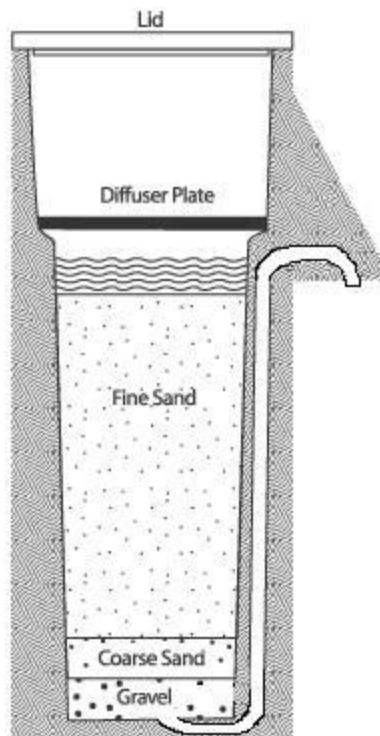
Biosand Filtration



- 0.3m x 0.3m x 0.9m
- Weight: 170 lbs.
- Costs: \$10-45 USD



Biosand Filtration

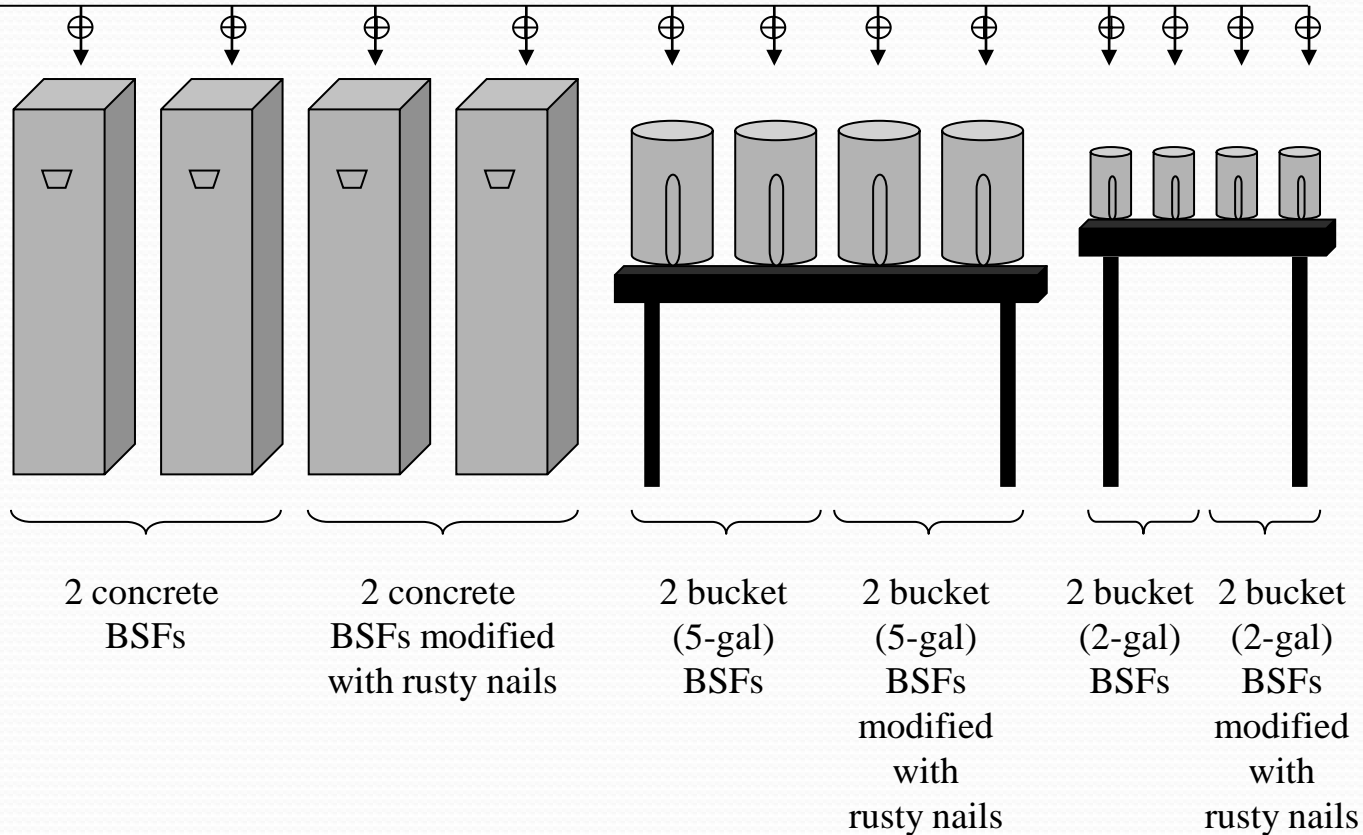


2 L Pitcher Filter



Biosand Filtration

From spiked
water tank



Biosand Filtration

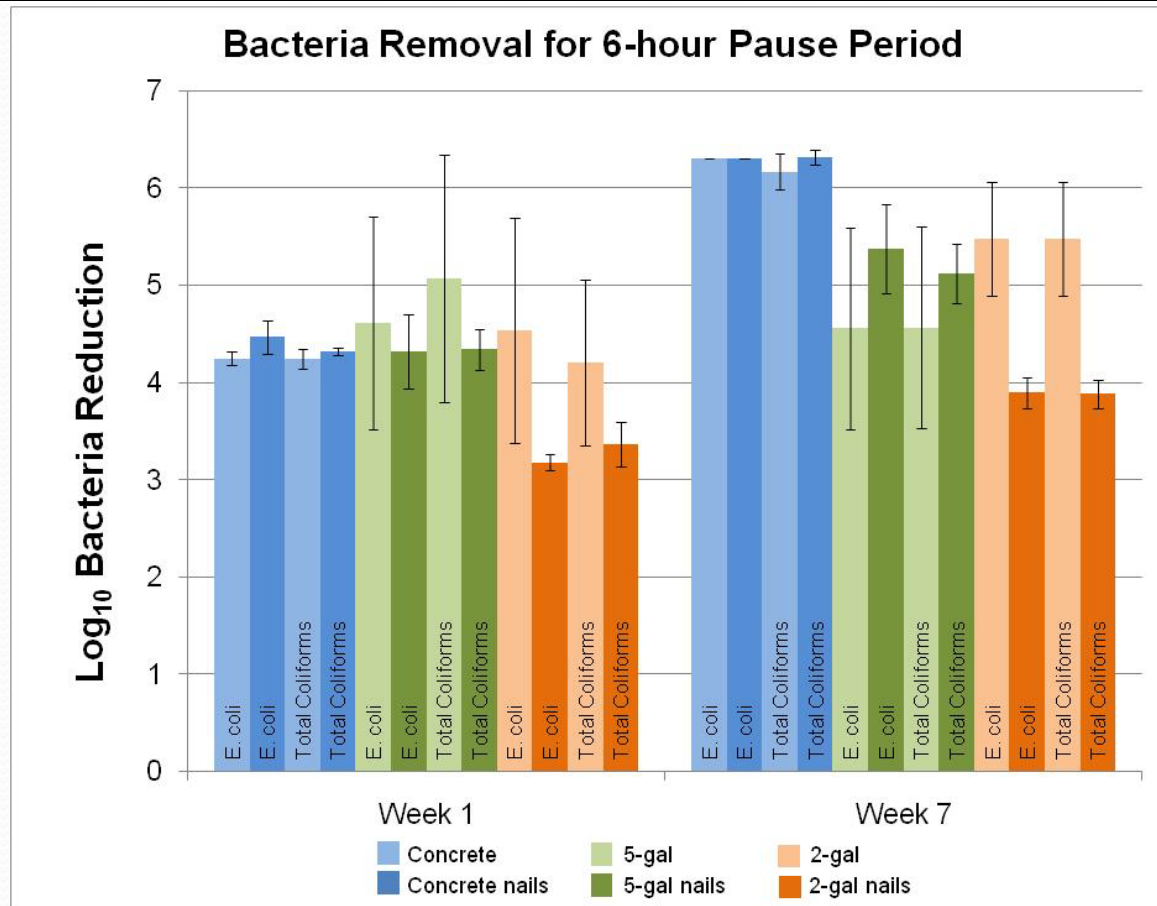


Biosand Filtration

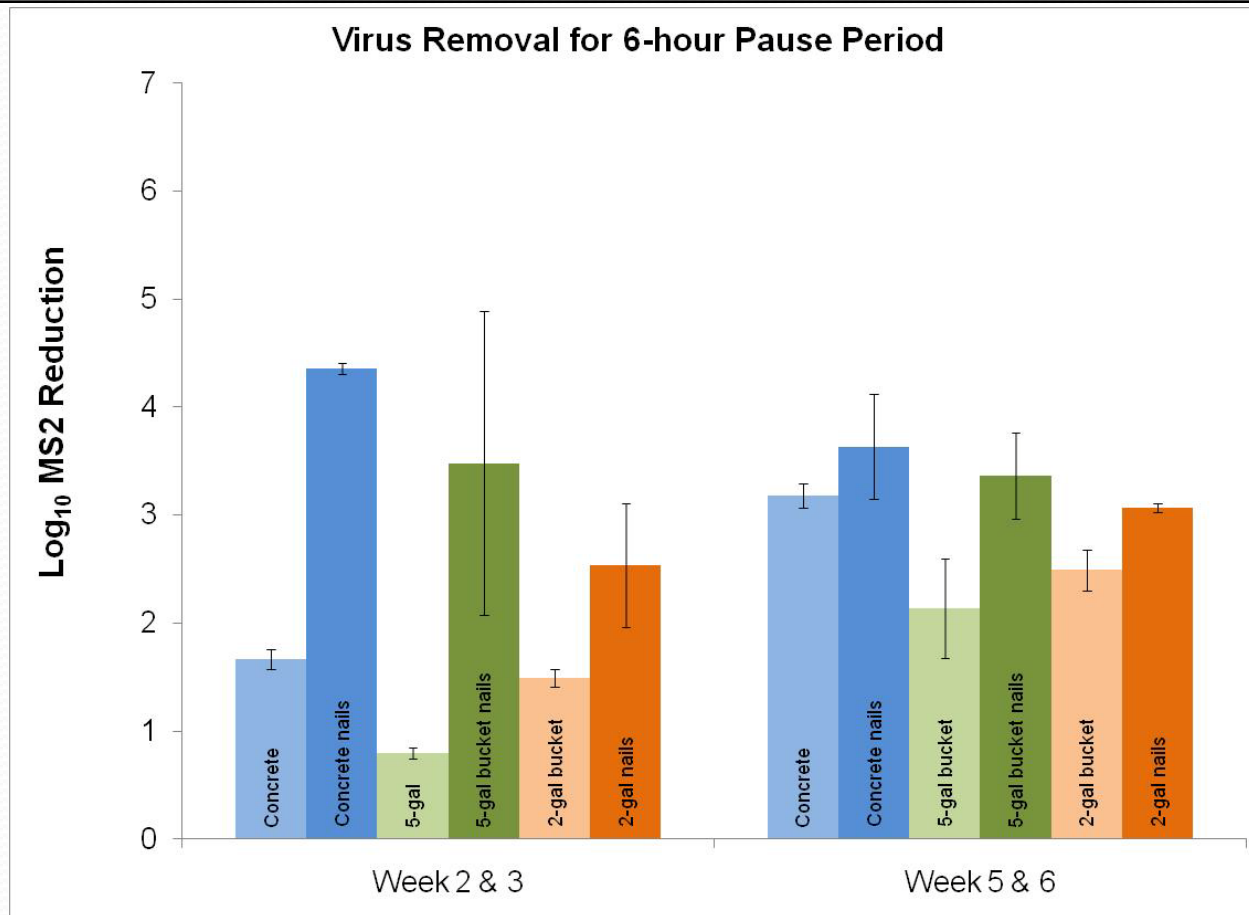


	Min	Max	Avg	Std Dev
Influent	4.82	61.37	30.17	18.40
Concrete	0.15	1.61	0.43	0.29
5gal buckets	0.15	1.60	0.46	0.31
2gal buckets	0.23	1.41	0.53	0.28

Biosand Filtration

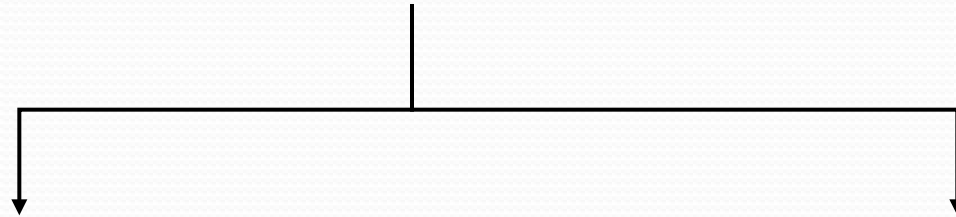


Biosand Filtration



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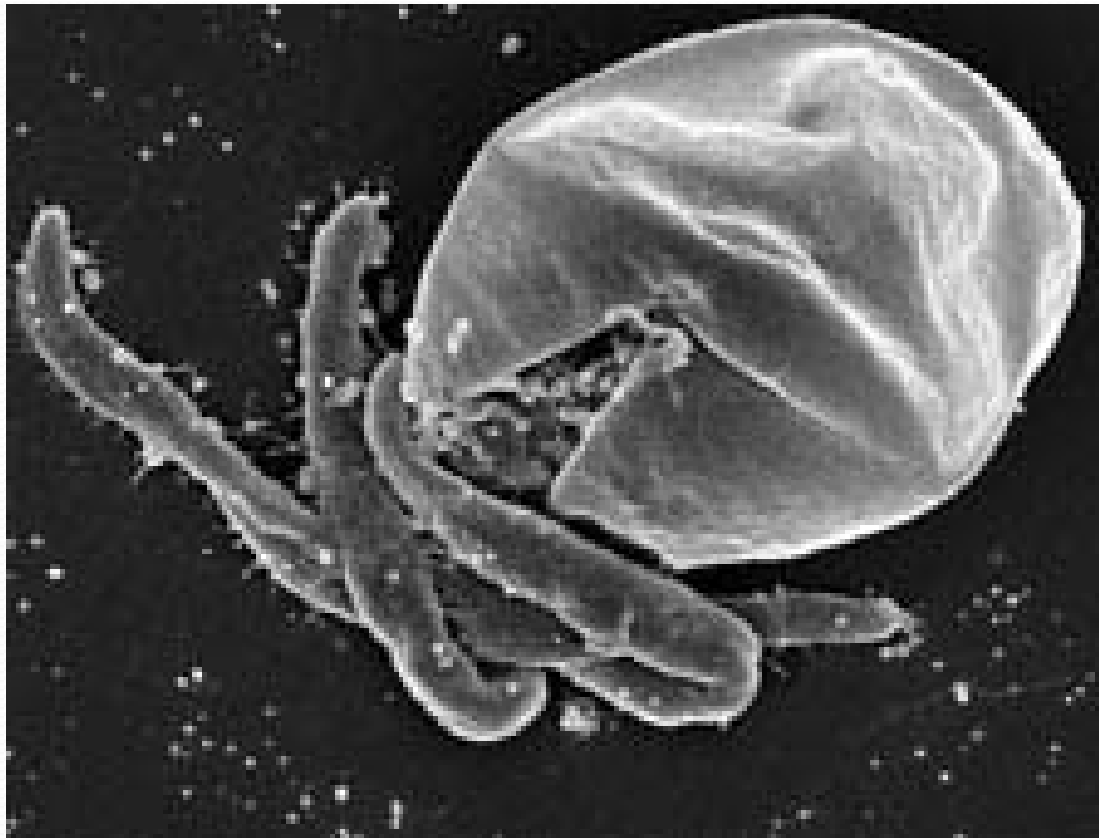


Water treatment technologies
(emphasis on developing countries)

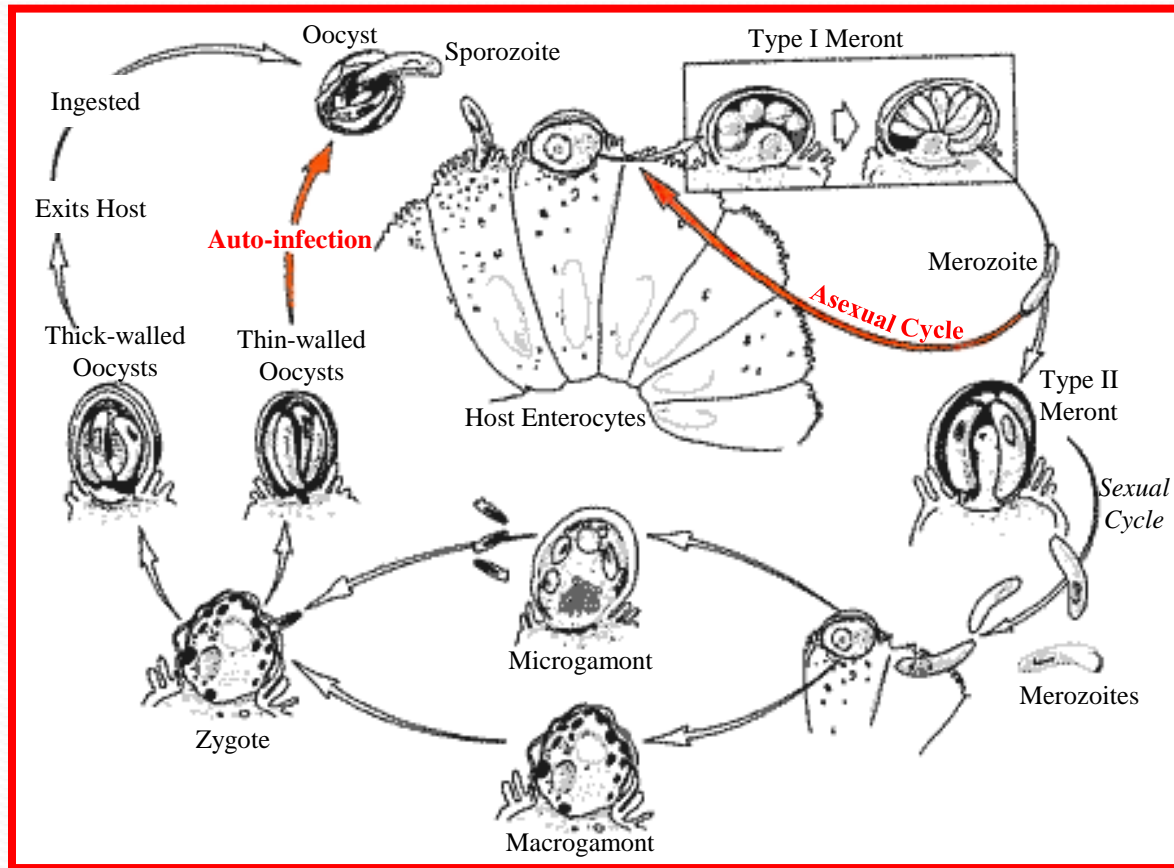
- Ceramic filtration*
- Biosand filtration*

Watershed management
-Parasite fate and transport

Cryptosporidium



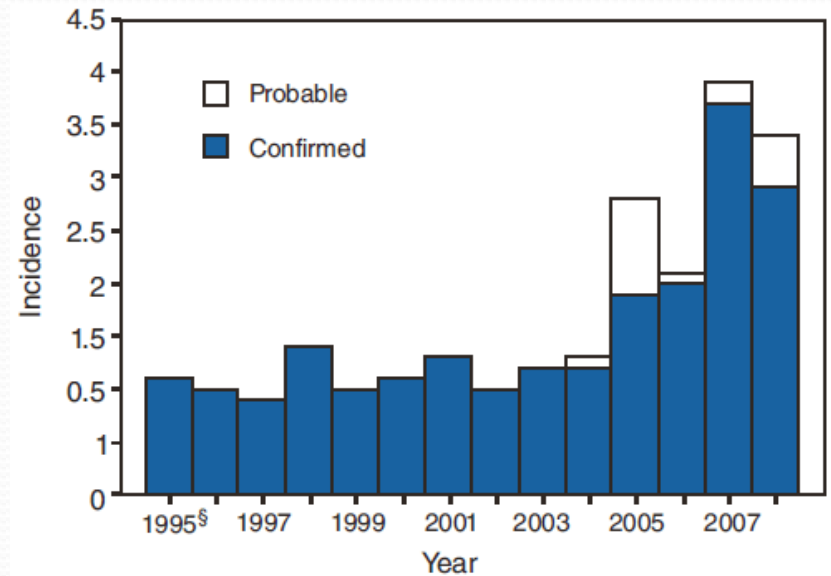
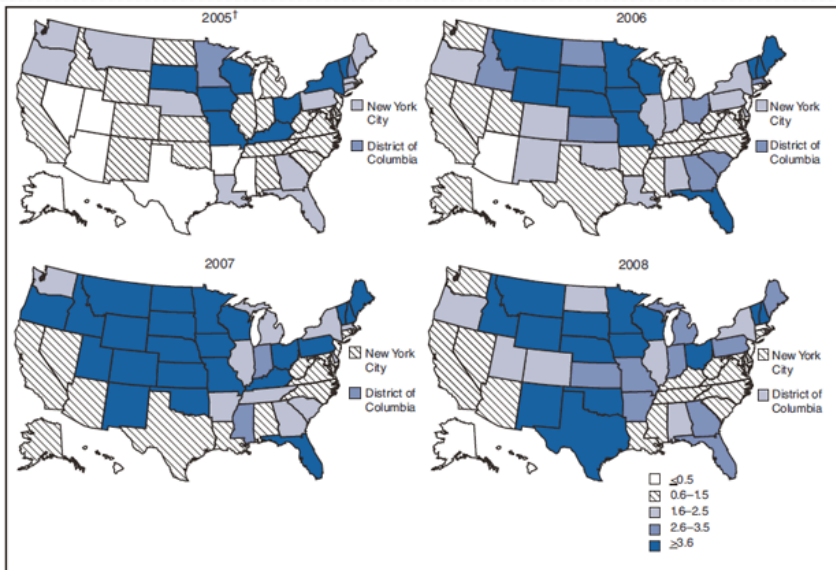
Cryptosporidium Life Cycle



(Adapted from Current & Blagburn, 1990)

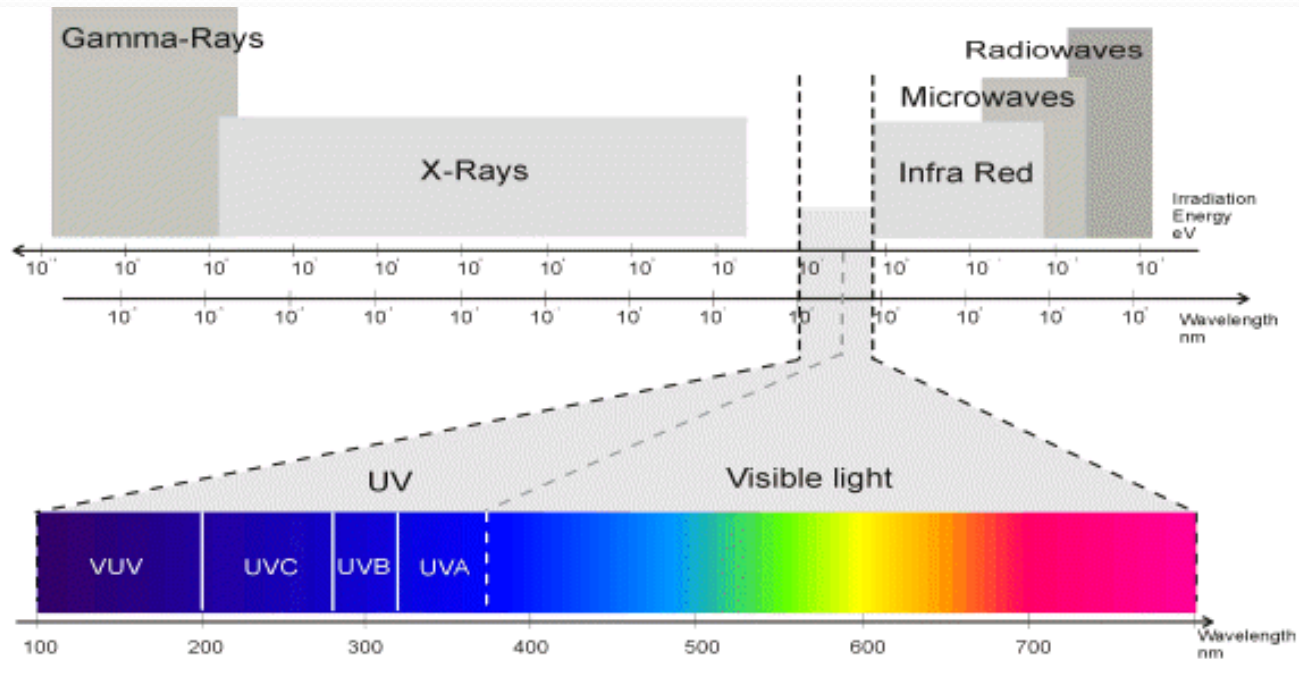


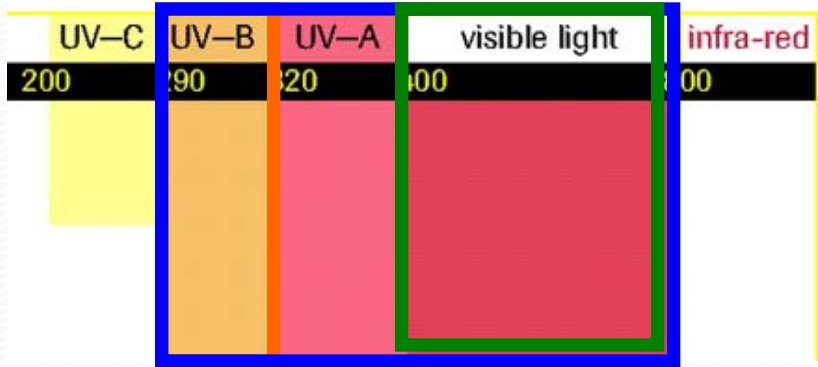
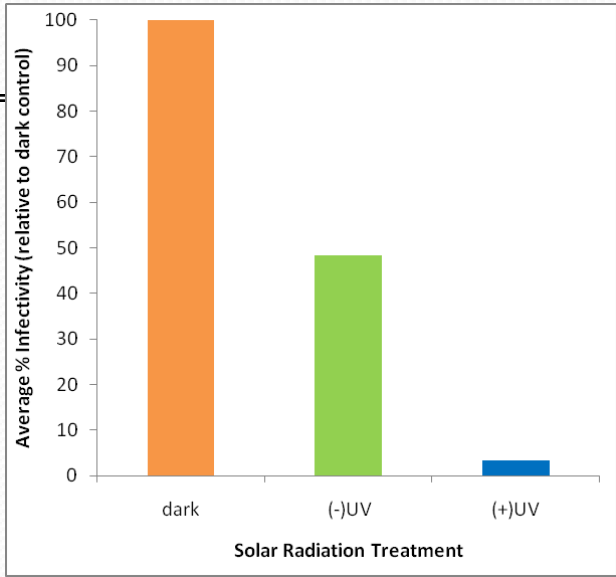
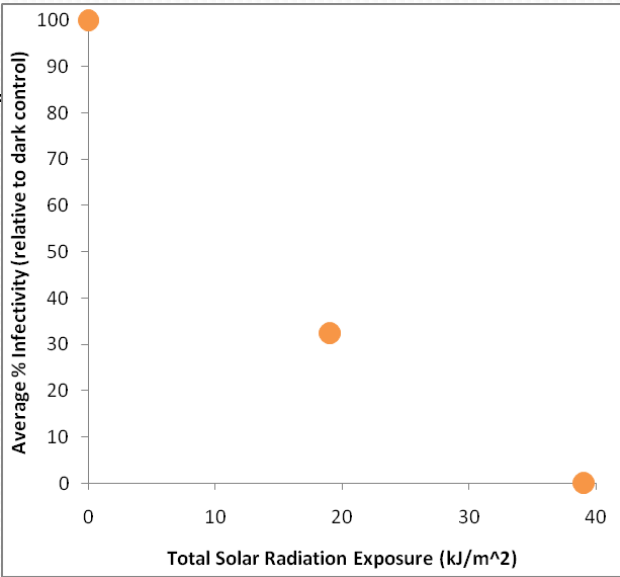
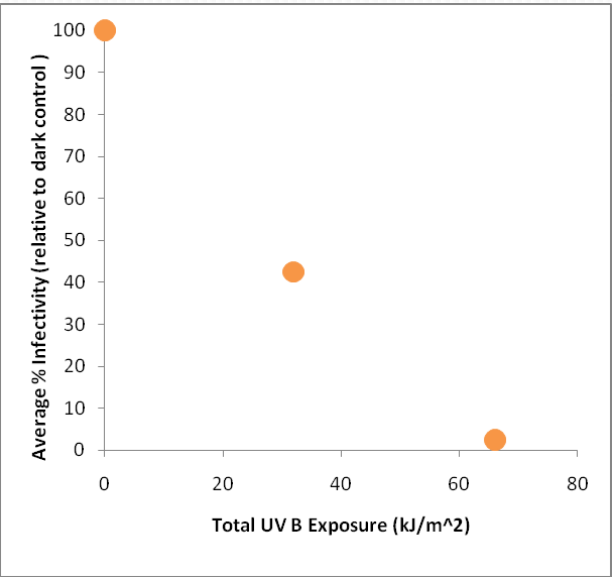
Cryptosporidiosis



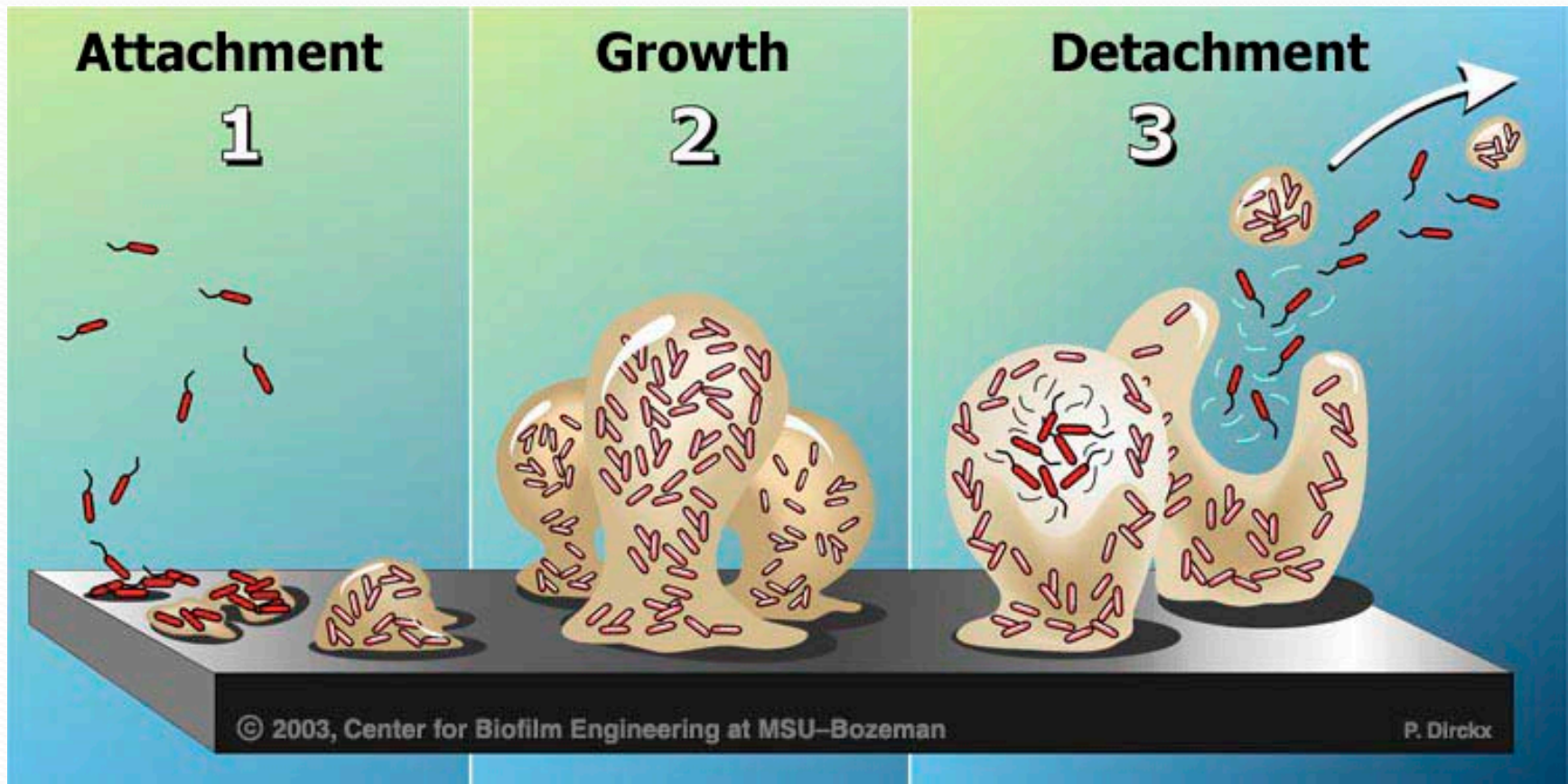
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Solar UV Radiation



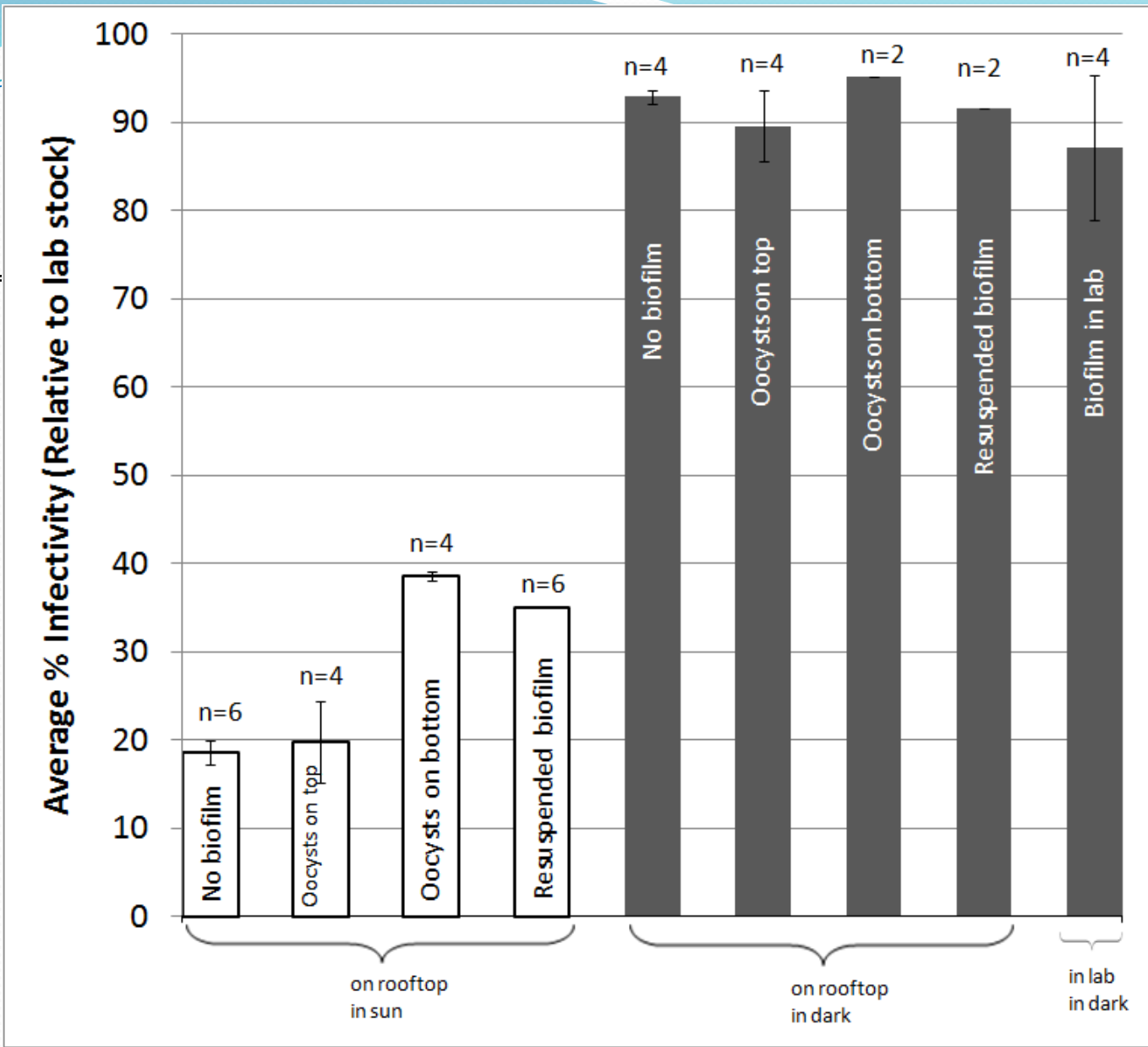


Cryptosporidium and Biofilms



Solar Exposure





Summary

Ultimate goal: reduce prevalence of waterborne disease

- Optimize household water treatment options in developing countries and develop standard operating procedures for their use
- Understand parasite fate and transport in the environment
- Identify public health risk associated with parasites in drinking water supplies
- Improve methods for watershed monitoring of parasites

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Questions?



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