

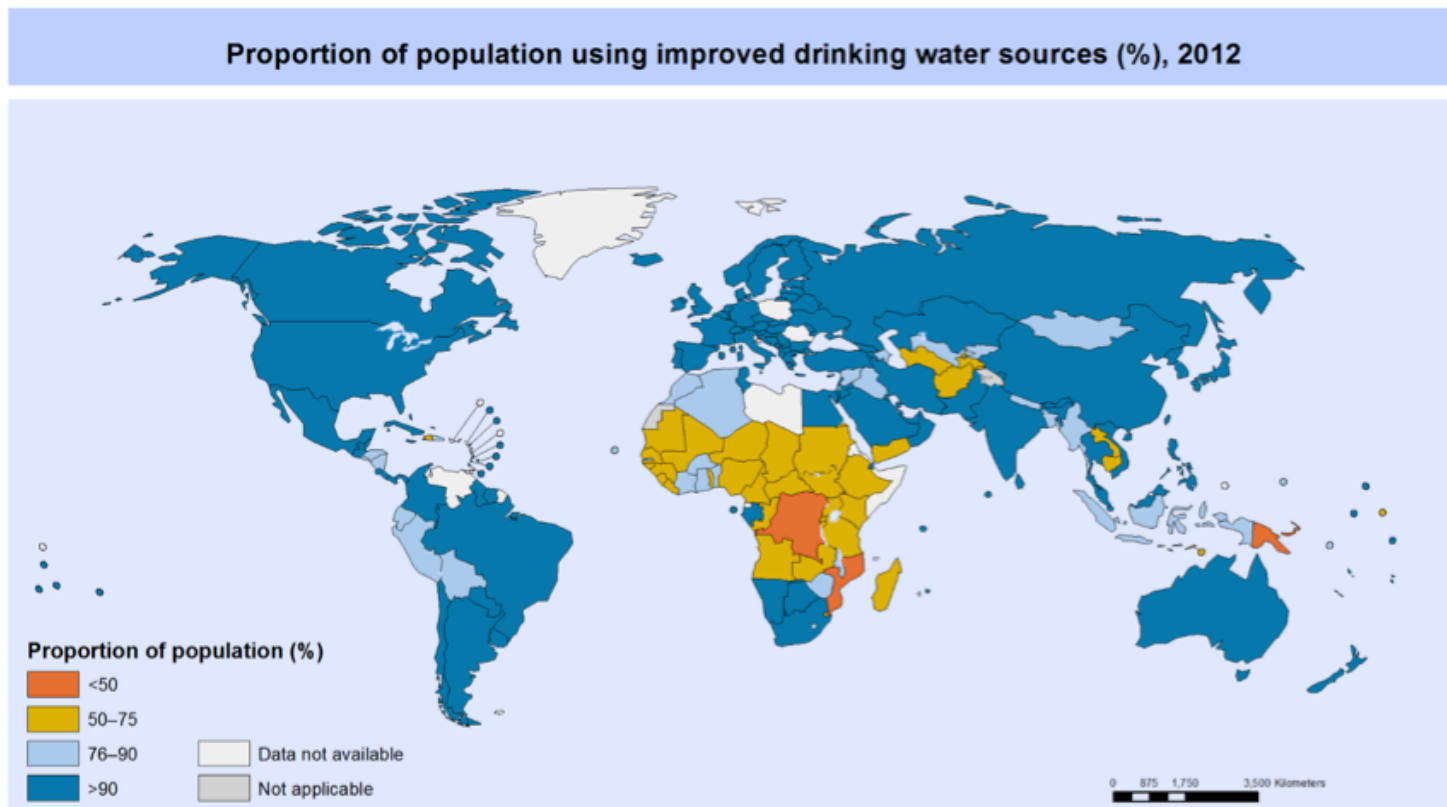
NanoFiltration



Access to clean drinking water is a global issue.

Turn and talk:

What are 3-4 interpretation statements you can give for this map of data?
Include one for the United States.



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Health Statistics and
Information Systems (HSI)
World Health Organization



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Perception:

Water issues are only in other parts of the world

India, Vietnam, Africa, China



Reality for the the United States

Millions in U.S. Drink Dirty Water, Records Show

By CHARLES DUHIGG DEC. 7, 2009

Katrina's Toxic Legacy



Pollution & Debris Stirred by Sandy Threaten Coastal Waters

by Becky Oskin, Senior Writer | October 31, 2012 07:46pm ET



Water contamination issues in the United States



How tap water became toxic in Flint, Michigan

By Sara Ganim and Linh Tran, CNN

🕒 Updated 10:53 AM ET, Wed January 13, 2016



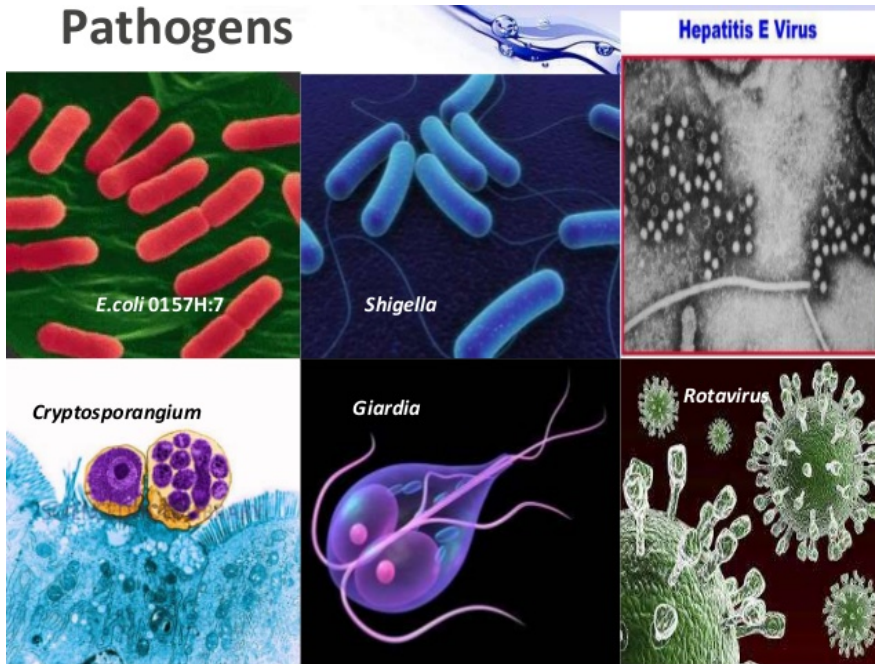
Animas River fouled by 1 million gallons of contaminated mine water

EPA accidentally releases water; Durango residents warned to cut back on water use as health officials evaluate river

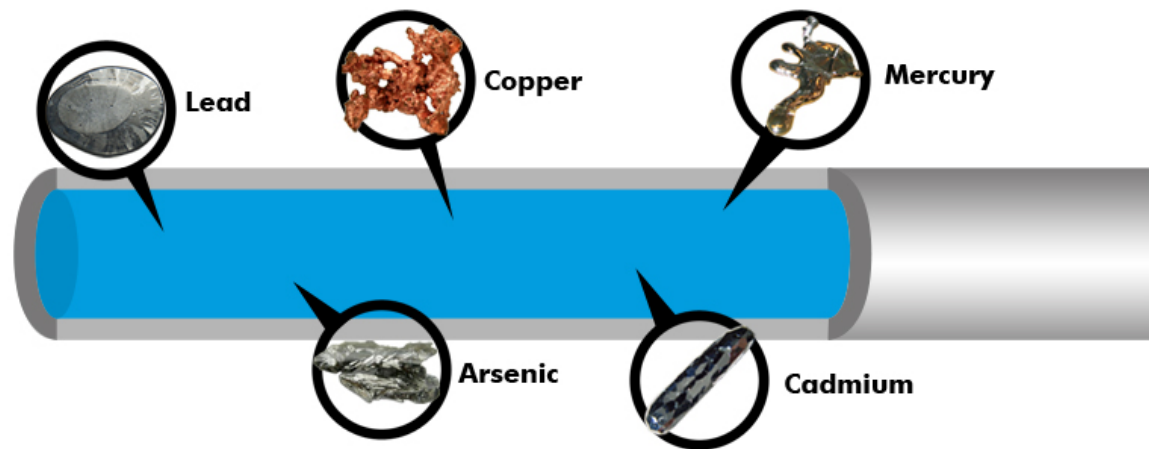
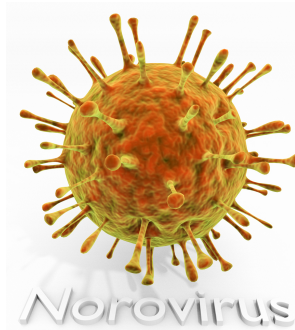
By Jesse Paul and Bruce Finley

The Denver Post

Pathogens



What are some water contaminants?



What are the sizes of common water contaminants that filters need to remove?

In pairs or small groups,
sort the cards from smallest to largest
contaminant based on your current knowledge.

Summary of water pathogens

Pathogen	Type	Treated with	Width	How sick does it make you?
E. coli	Bacteria	Chlorine	500 nm	Symptoms last from 5-7 days and include: low fever, nausea, vomiting, stomach cramps, and bloody diarrhea.
Giardia	Protozoa	Chlorine	5,000 nm	Symptoms last 5-7 days and include: violent diarrhea, excess gas, stomach or abdominal cramps, upset stomach, and nausea.
Cryptosporidium oocyst	Protozoa	Filter	4,000 nm	Symptoms last 10-14 days and include stomach pains and a low fever.
Norovirus	Virus	Chlorine	27-38 nm	Symptoms last 5-7 days and include: nausea, forceful vomiting, watery diarrhea, and abdominal pain. Norovirus is leading cause of foodborne illness in the United States.
Shigellosis (AKA Dysentery)	Bacteria	Chlorine	400 nm	Symptoms last 5-7 days and include: diarrhea, nausea, vomiting, and abdominal pain.
Hepatitis A	Virus	Chlorine	27 nm	Symptoms last for 5-7 days and include: Fatigue, nausea, vomiting, abdominal pain, low fever, dark fever, joint pain, yellowing of skin and eyes
Legionella (AKA Legionnaires disease)	Bacteria	Chlorine	300-900 nm	Symptoms last 5-7 days and include: Muscle pains, high fever, chills, chest pain, confusion, nausea, vomiting, diarrhea, and shortness of breath.
Campylobacter	Bacteria	Chlorine	255-409 nm	Symptoms last for 5-7 days and include: bloody diarrhea, nausea, vomiting, cramping, abdominal pain, and fever,



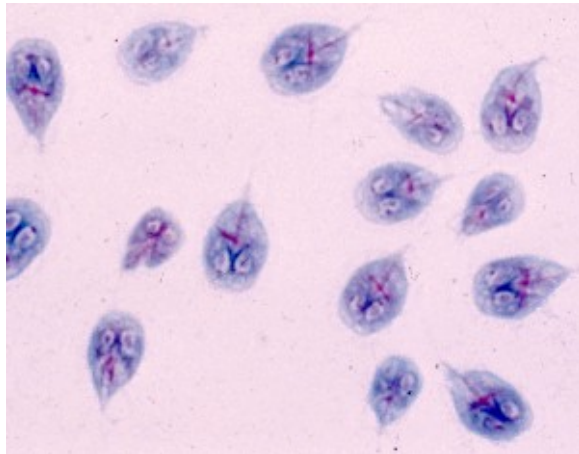
Design a model of a mechanical water filter



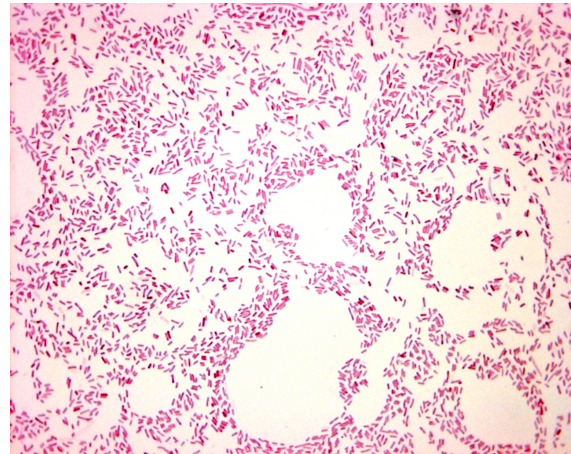


Search for contaminants through the light microscope.

Examples:

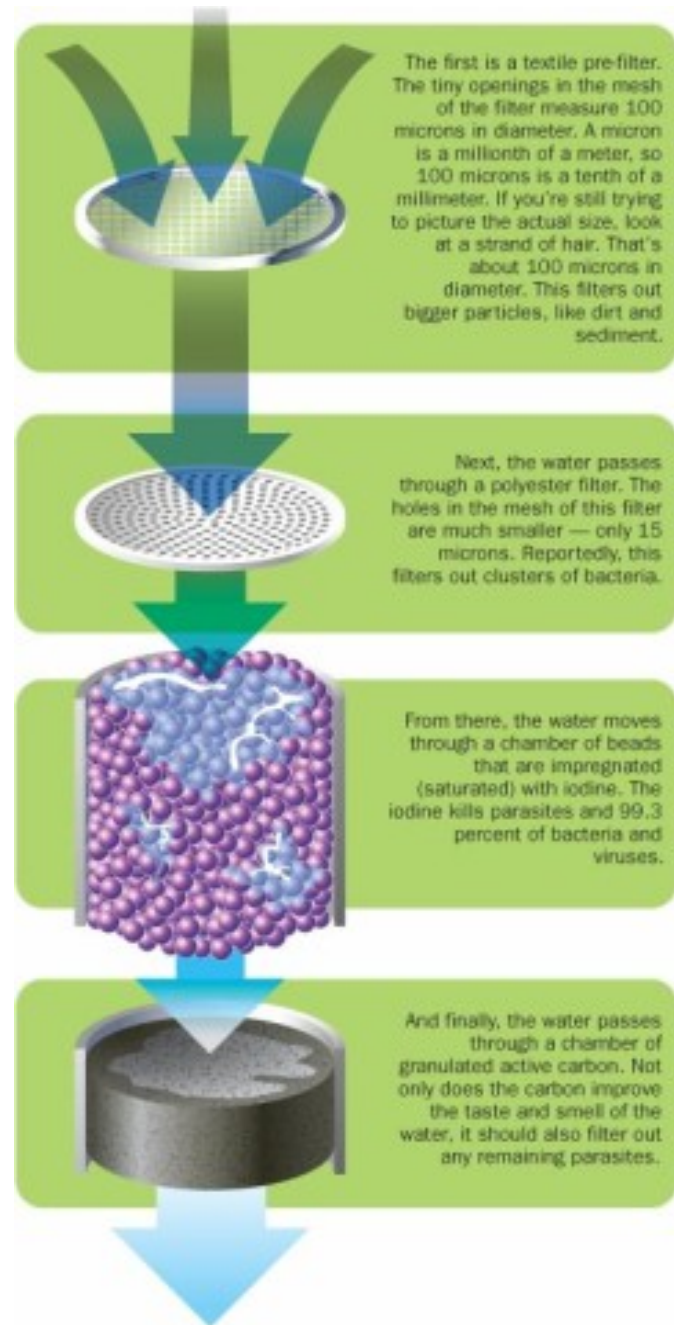


Giardia

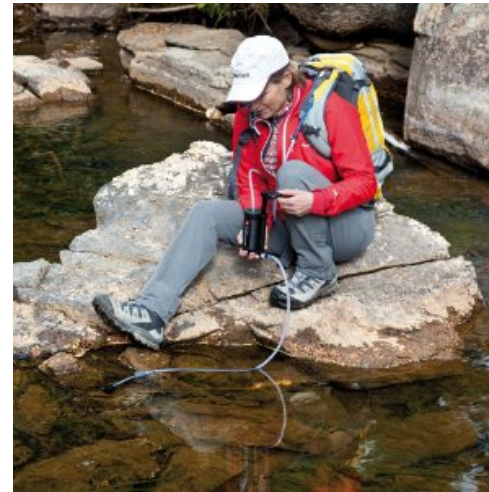


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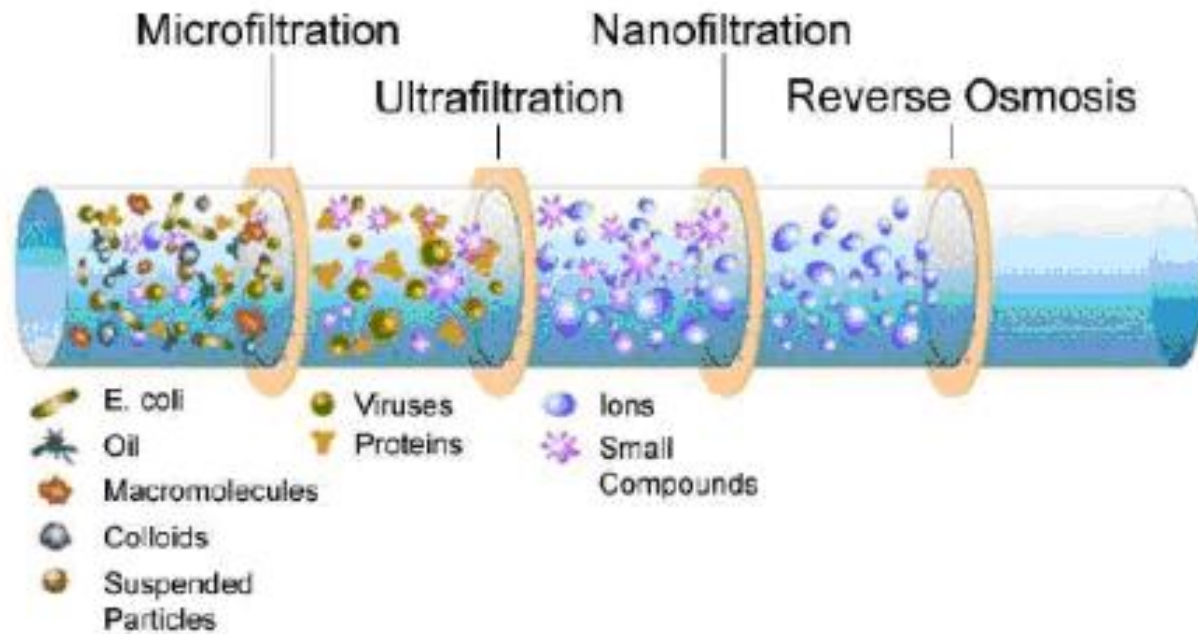
Test a Water Microfilter. ("LifeStraw")



People using water microfilters across the world



Micro to Nano Filtration



Stanford Research Institute Web. 22 June 2012.

www.scribd.com/doc/33490659/FF-NanofiltrationSlides

Micro to Nano Filtration

Benefits of Nanofiltration

- Low cost of operation.
- Low energy cost.
- Lower discharge and less waste water than typical Reverse Osmosis system.
- Reduction of Heavy Metals (removes 95%).
- Reduction of water hardness.
- Reduction / Removal of viruses, bacteria and Pesticides.

Additional powerpoint slides at
www.slideshare.net/aqeelahamad9/nano-filtration-in-water

