Monitoring and Mapping the Impacts of Sewage

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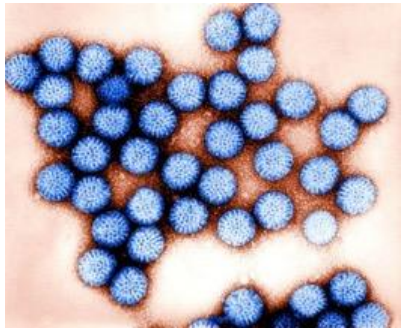
Hundreds of Pathogens are found in Excreta and Sewage

- Over 100 pathogens can be found in feces in high numbers

They cause diseases that are acute (e.g. hepatitis and diarrhea, respiratory illness) & chronic illnesses (e.g. heart inflammation, cancer, neurological disorders liver damage, kidney failure, heart disease, cancer, nervous system disorders) birth defects, death.

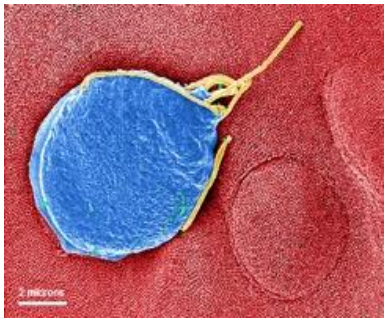


Viruses

Rotavirus
HAV
Norovirus

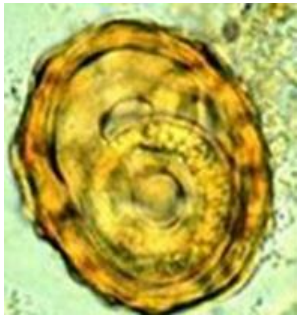
Bacteria

Cholera, Typhoid
Vibrio, E.coli,
Salmonella,
Legionella



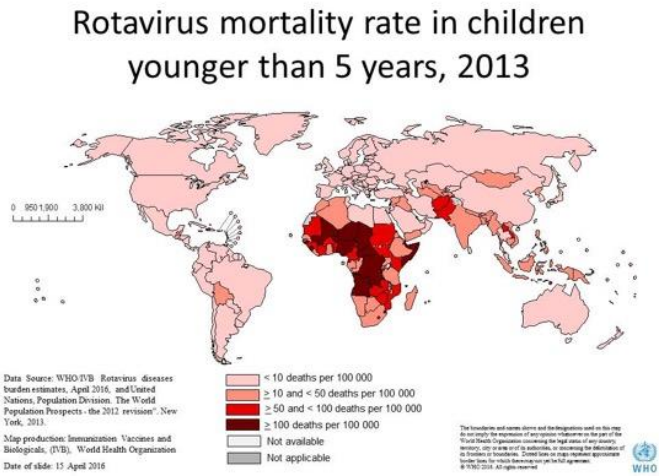
Protozoa

Cryptosporidium
Giardia
Entamoeba Histolytica

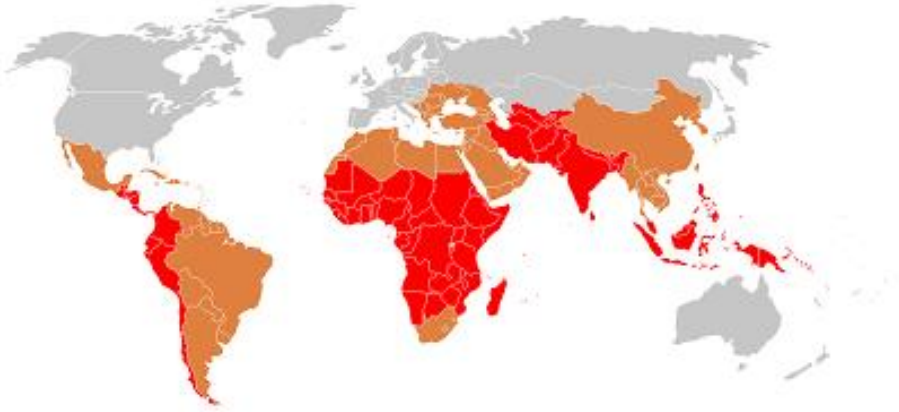


Helminths eggs

Hookworm

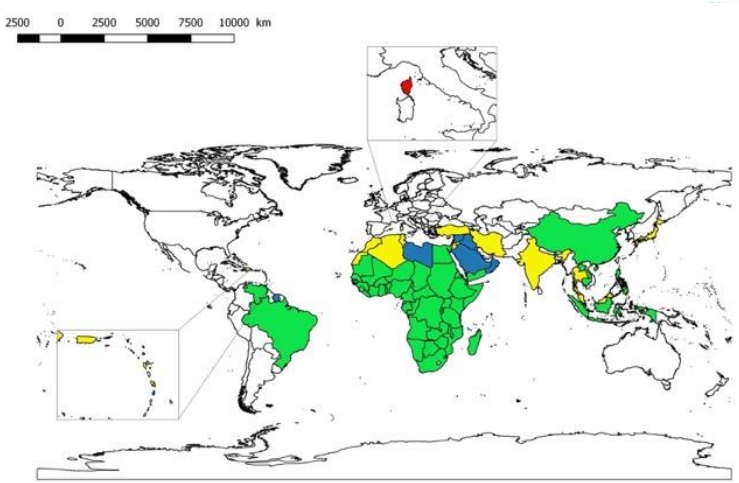


rotavirus



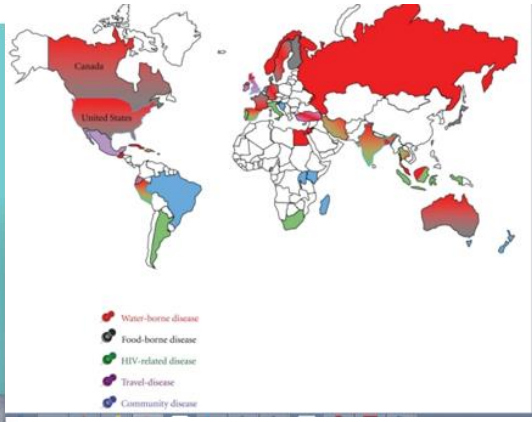
Typhoid Fever

Why Pathogens Matter



Shistosoma

Cholera



Cryptosporidium

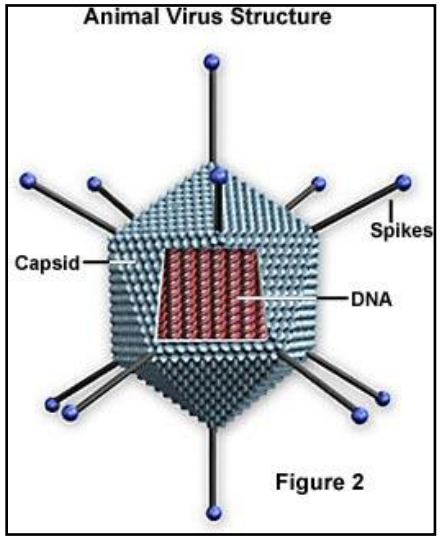
Why pathogen type is important to the science of sewage and health?

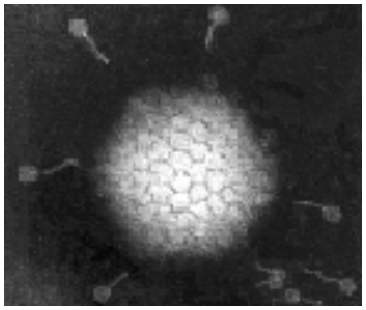
- **Size (viruses < bacteria < protozoa < helminths)**
  - Important for removal or disinfection through treatment systems
  - Important for transport into groundwater
- **Persistence/ survival in the environment** are different
- **Removal by treatment systems** varies by organism type
- **Variance in their potency and disease risks**
- **Indicators are inadequate** [*E.coli (coliforms) are bacteria]*

VIRUSES ARE OBLIGATE PARASITIC BIOLOGICAL ENTITIES

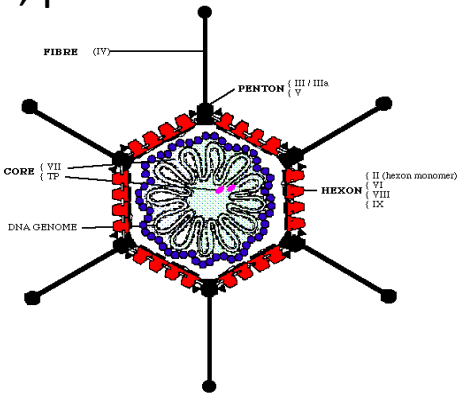
REPLICATE ONLY INSIDE A HOST CELL AND PRODUCE NANO STRUCTURED VIRONS

- Viruses have a simple structure, made up of DNA or RNA and a protein capsid. Some have an envelope (with a lipid component surrounding the protein coat.

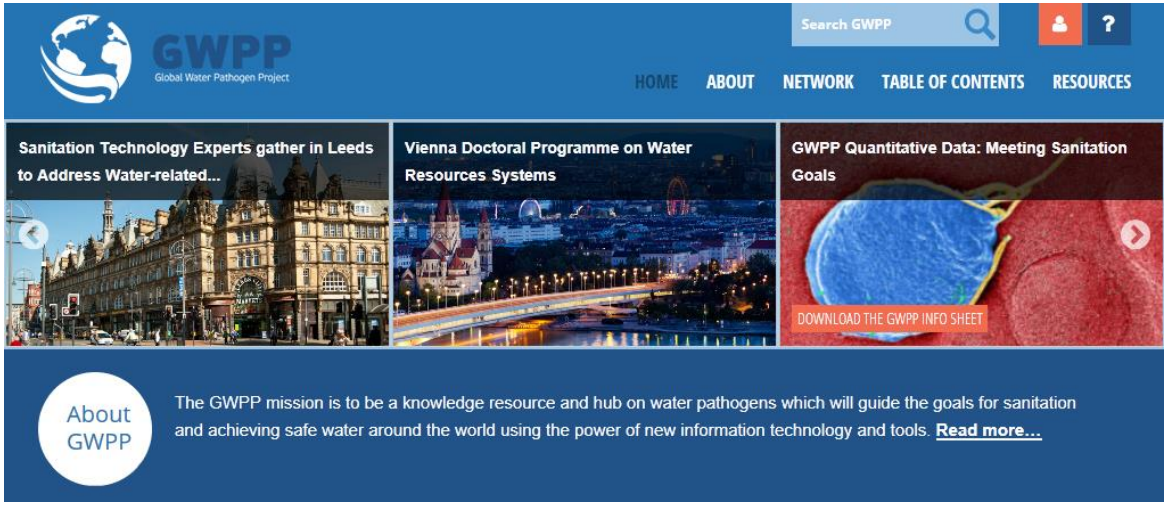




- Viruses are everywhere in the world. Spread from people, animals, plants air and water.



Global Water Pathogen Project: Passionate science moving to action



GWPP has built an online platform that includes 115 chapters, 391 data tables, 7336 scientific resources, 392 glossary terms and a GWPP network of over 250 people from 52 countries.

The GWPP mission is to be a knowledge resource and hub on water pathogens which will guide the goals for sanitation and achieving safe water around the world using the power of new information technology and tools.

www.waterpathogens.org

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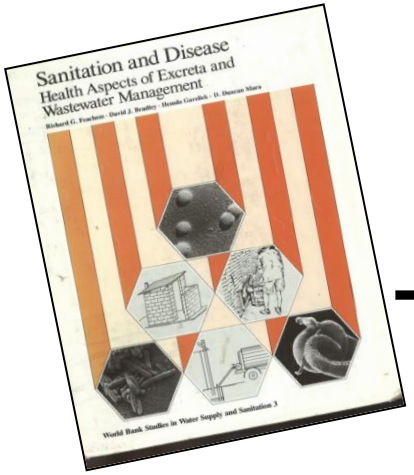
K2P- Using data generated from the Global Water Pathogen Project (GWPP)



Viruses
9 chapters

Bacteria
10 chapters

Protozoa
8 chapters

Helminths eggs
13 chapters

GWPP
Global Water Pathogen Project

GWPP-K2P Sanitation Decision Support Tools

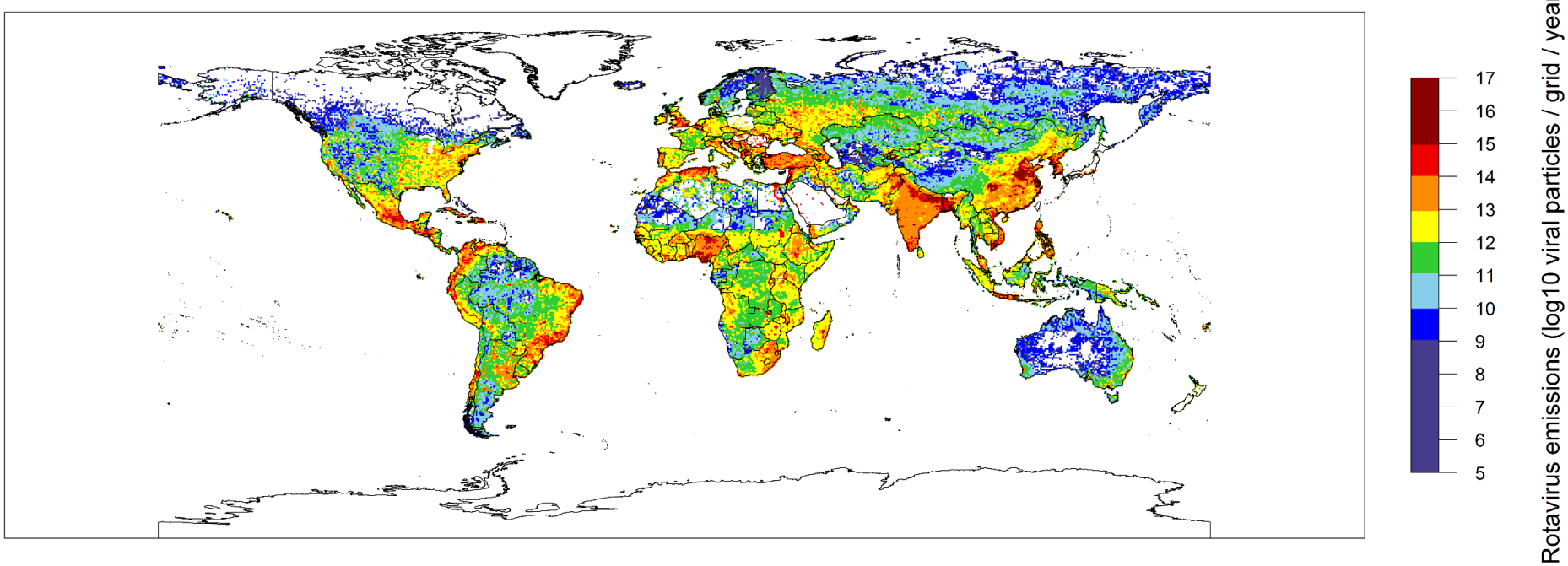
Choose one of the following:

- Pathogen Flow Tool
- Pathogen Mapping Tool
- GWPP-K2P Database
- Case Studies

Mapping Global pathogen assessment – Why?

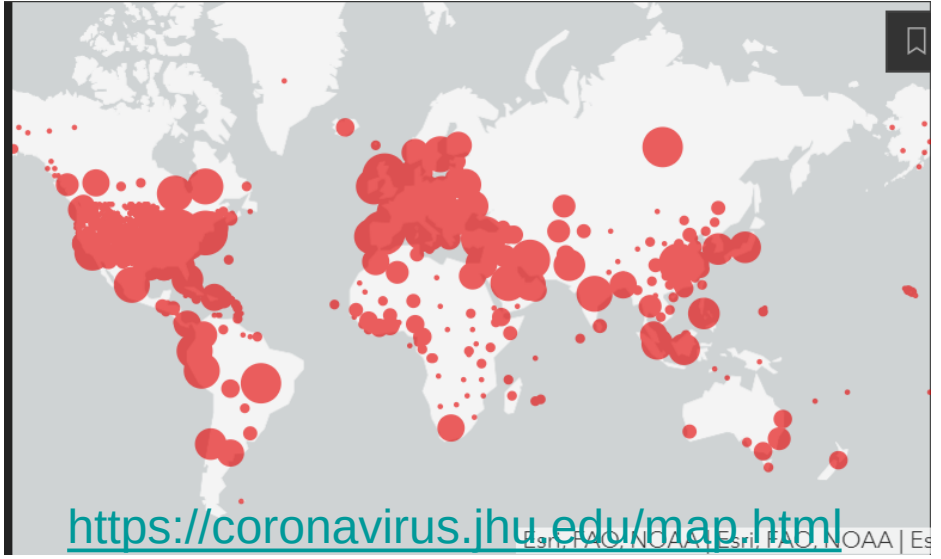
- Hotspot identification
- Better understanding trans-boundary water contamination issues
- Highlight links between land-use, climate, water quality and health
- Examine scenarios for decision making

Global emissions of Rotavirus from populations: fecal excretion and via sewage



Hotspot regions with high RV emissions are urban areas in densely populated parts of the world, such as Bangladesh and Nigeria, while low emissions are found in rural areas in North Russia and the Australian desert. Even for industrialized regions with high population density and without tertiary treatment (disinfection), such as the UK, substantial emissions are estimated. Kiulia et al., 2017

Occurrence of SARS-CoV-2 in Sewage may be a way to monitor the infection in the community



1. To link disease cases and infections (asymptomatic, those with mild symptoms and those symptomatic) in the community with concentrations in sewage.

2. To be able to monitor increasing spread, speed of spread, second waves, impacts of social distancing, re-opening of cities.

3. To identify hot spots and provide early warnings (potential seasonal outbreaks).

Wastewater surveillance

Preliminary locations where sewage monitoring is or may be occurring.

We can learn about community health and global disease by comparative spatial and temporal analysis

Thank You!

http://www.waterpathogens.org/