Analyzing Bacteria Found in Rainwater Collection Systems through Next Generation Sequencing

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Introduction

- Rainwater collection systems are a way to collect and store rainwater runoff for non-potable use in homes.
- Tests to verify cleanliness of the water often underestimate the level of bacterial pathogens (Ramírez-Castillo et al., 2015).
- Next Generation Sequencing (NGS) allows for large numbers of unknown DNA sequences to be transcribed into data files for analysis (Weiss et al. 2020).
- Using NGS on water samples will help determine what bacteria and pathogens are present in the rainwater collection systems

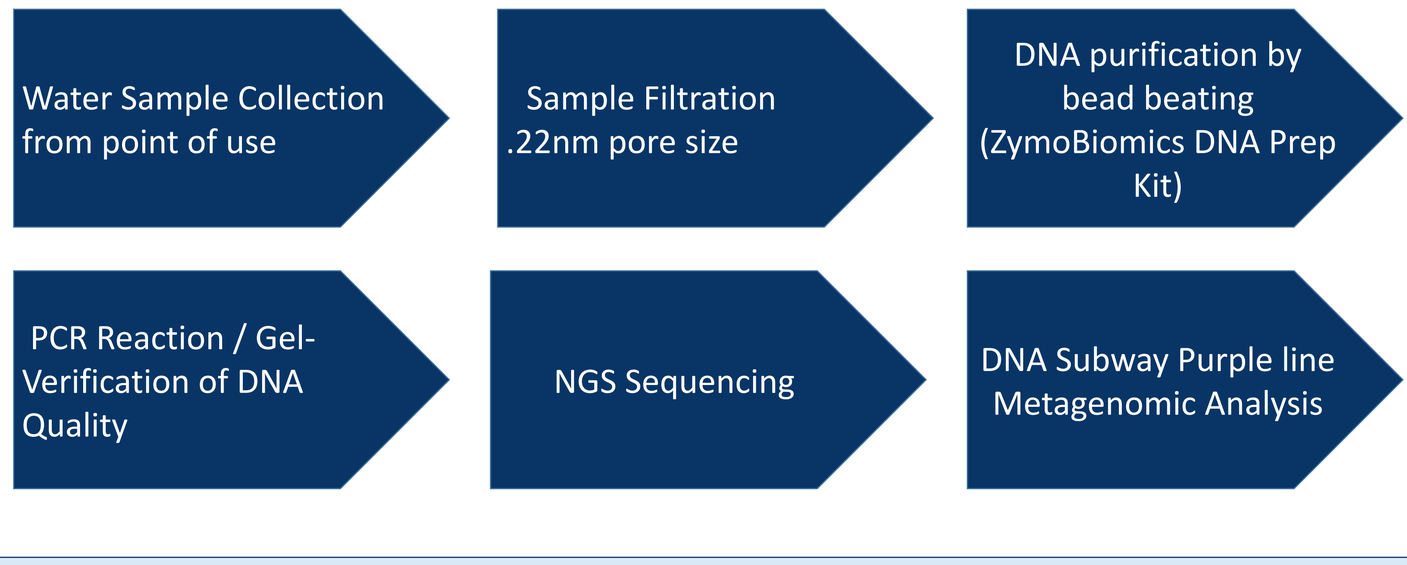
Research Topic

Research Question: What bacteria is present in rainwater collection systems?

Hypothesis: There is a wide range of bacteria present in rainwater collection systems

Importance: Determining common bacteria and pathogens present in rainwater collections systems can help educate owners and improve public safety.

Methods



Results

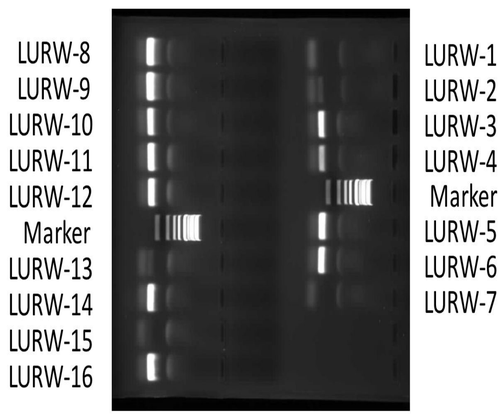


Figure 1. Gel electrophoresis of DNA collected from each sample and its corresponding marker (only samples 1-16 shown) This Gel verifies that we had enough quality DNA .

Sample ID	Sample Site	Total Coliform: Positive Large Wells	Total Coliform: Positive Small Wells	Concentration (MPN/100mL)
CF1A	CF1	2	0	2
CF1B	CF1	2	0	2
CF1C	CF1	1	1	2
CDP A	CDP	9	3	13.1
CDP B	CDP	5	2	9.4
CDP C	CDP	8	1	8.6

Table.1 Sampling Results for total coliform of sample CF1 and CDP collected using IDEXX colilert- a colony counting system.

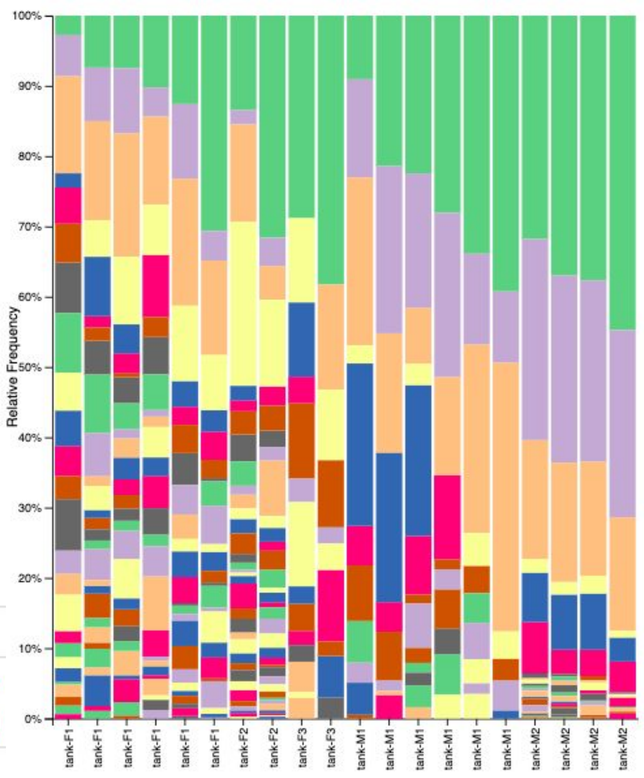


Figure 2: Relative frequency of taxonomic diversity in different tanks from sample data. Each color represents a unique classification of organism down to the genus.

References

- Ramírez-Castillo, F., Loera-Muro, A., Jacques, M., Garneau, P., Avelar-González, F., Harel, J., & Guerrero-Barrera, A. (2015). Waterborne pathogens:Detection methods and challenges. Pathogens, 4(2), 307–334.
- Weiss, T., Mayle, A., & Nash, B. (2020). The microbes found in the honey of New York City beehives. bioRxiv
- .https://tinyhouselife.org/a-definitive-guide-to-creating-a-rainwater-collection-system-for-your-tiny-house/
- https://dnasubway.cyverse.org/project/ub/panel/8297

Conclusions and Future Directions

- The results found from this sample data demonstrate how the DNA Subway, Purple Line will show types of bacteria and relative frequencies
- The data from this research is the first assay in a larger study to determine how bacteria found in rainwater collection systems changes with seasons, so this same assay will be revised and reused to study more samples in the future.
- Figure 2 is representative of bacteria found in the musk of snakes. Data shown represents our expectation for the amount of bacteria present.

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