



Citizen Science Community of Practice Meeting (September 21, 2017)

Using Citizen Science to Improve Drinking Water Epidemiology Studies



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Citizen Science Community Meetings in Puerto Rico



Community Drinking Water Projects Patillas, Puerto Rico (Since 2013)



Conventional Treatment and UV System Studies, Upper Source, Apeadero, Puerto Rico



Biosand Filters, Lower Source, Apeadero, Sand Filter/UV System Studies, La Sofia, Puerto Rico



Community Volunteer Assistance and Citizen Science





Community Volunteer Training and Citizen Science





Community Volunteer Training for Analysis of Bacteria in Drinking Water



An IDEXX Quanti-Tray System provided by EPA Region 2 for Citizen Science Studies



Analyst	Sample ID	Readings 2Aug17			Readings from 3Aug17					
		UV		E. coli	Light		UV		Total Coliforms	E. Coli
		Large Cells	Small Cells	/100 mL	Large Cells	Small Cells	Large Cells	Small Cells	/100 mL	/100 mL
EPA	Blank	0	0	<1	0	0	0	0	<1	<1
EPA	Lower Source	30	2	47.1	49	13	42	3	152.3	90.5
CS	Lower Source	37	2	67	49	4	44	2	158.5	99.1
EPA	Biosand Filter	11	0	12.2	49	9	14	1	195.6	17.3
CS	Biosand Filter	9	0	9.8	48	16	14	0	228.2	16.1
EPA	After Lower Source	20	2	27.5	48	10	22	2	178.9	30.9
CS	After Lower Source	19	3	27.2	49	21	28	4	365.4	45.7
EPA	Tap Location	22	3	32.3	49	16	31	4	275.5	52.9
CS	Tap Location	18	0	21.8	48	5	22	0	148.3	28.2
EPA	Upper Source	21	0	26.5	8	0	4	0	8.6	4.1
CS	Upper Source	33	2	54.8	41	9	42	0	101.4	82.6
EPA	Water Boy	16	1	20.1	24	1	17	1	31.7	21.6
CS	Water Boy	7	0	7.5	13	0	9	0	14.8	9.8
EPA	Upper Storage	0	0	<1	0	0	0	0	<1	<1
CS	Upper Storage	0	0	<1	0	0	0	0	<1	<1
EPA	Tap Location	0	0	<1	0	0	0	0	<1	<1
CS	Tap Location	0	0	32.3	0	0	0	0	0	0



Using Citizen Science to Improve Drinking Water Epidemiology Studies

This citizen science project

- Investigates the incidence and type of gastrointestinal illness using fecal and saliva tests in rural communities in Puerto Rico without municipal drinking water treatment plants,
- Inspires 4th to 6th grade school children (non-experts) to actively participate in targeted studies to improve their health and understanding of water treatment,
- Relies on input from grade school science teachers, and
- Requires the development of communication materials.





Using Citizen Science to Improve Drinking Water Epidemiology Studies

The citizen science project will be based in Puerto Rico with EPA analytical support in Cincinnati, Ohio

- Studies of waterborne disease usually rely on self reported symptoms (diarrhea, vomiting, cramping, etc.)
- Parents and 4th to 6th grade school children will report gastrointestinal illness to the school office and/or science teachers to trigger follow-up fecal and saliva tests in impacted school districts.
- The incidence of illness will then be linked to specific EPA Region 2 community water systems using SDWA sample results and violations.



Andrew W. Breidenbach Environmental Research Center Facility
Cincinnati, Ohio



Center for Environmental Education, Conservation and Research
San German, Puerto Rico



Fecal Studies to Track Pathogens in 4th to 6th Grade Science Students

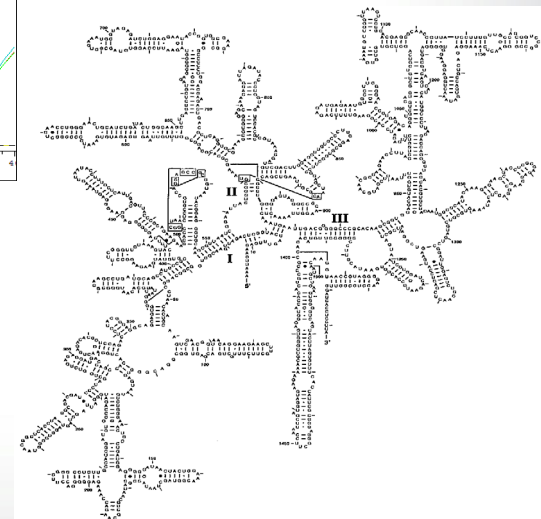
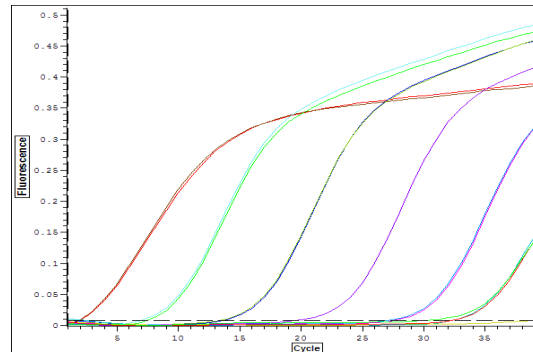
EPA NRMRL scientists will use DNA to determine the presence and relative abundance of different bacterial groups

➤ Next Gen Sequencing

- 16S rRNA gene
- Metagenomics

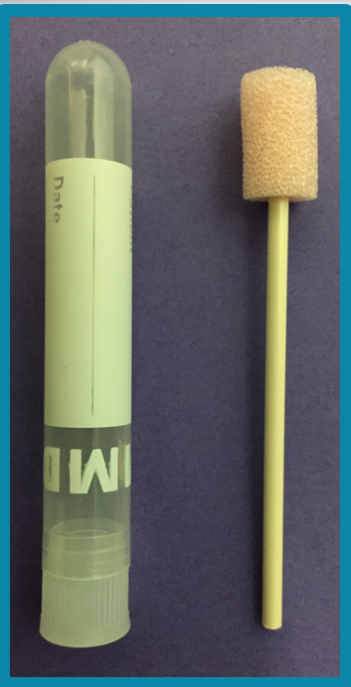
➤ PCR and qPCR assays

- Pathogen specific gene assays
- 16S rRNA gene group and genus specific assays

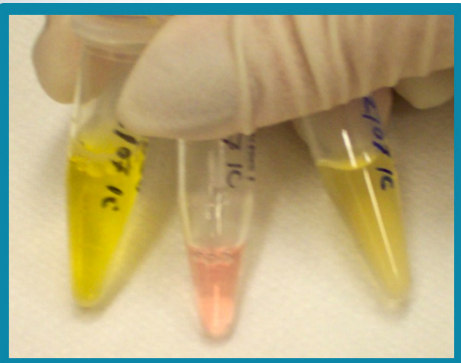




Saliva Studies to Track Pathogens in 4th to 6th Grade Science Students



- Saliva samples will be analyzed for antibodies as non-invasive indicators of infection with various waterborne pathogens using an innovative Luminex microbead assay developed by EPA NERL scientists.
- Saliva is an inexpensive and safe alternative that is easy to collect (especially with children who are more susceptible to waterborne disease than adults).
- Students will serve as citizen scientists to self-collect saliva samples and fill out health diaries.
- EPA scientists will estimate incidence of infection to evaluate associations between community health and drinking water treatment.





Using Citizen Science to Improve Drinking Water Epidemiology Studies

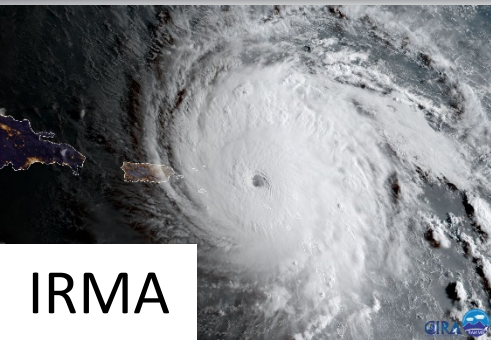
The anticipated outcomes of this project are to provide

- A direct link between community health and drinking water treatment using citizen science in underserved communities in rural Puerto Rico and
- A model for similar citizen-supported epidemiology studies throughout the U.S with the impetus for installation of adequate filtration and disinfection treatment processes for SDWA compliance.





Questions?



IRMA



MARIA