



COVID-19 Wastewater Epidemiology: Statewide Surveillance Facility Instructions

Introduction

This project is a collaborative effort among COVID-19 Unified Command, state agencies [Division of Water Quality (DWQ), Department of Health (DOH)], local health districts, several universities [University of Utah (UU), Utah State University (USU), Brigham Young University (BYU) and Dixie State University] and numerous local public utility professionals who have volunteered assistance with sample collection efforts.

RNA concentrations of SARS-CoV-2—the virus responsible for the COVID-19 pandemic—will be quantified from the influent of wastewater treatment plants to obtain quantitative estimates of community-scale COVID-19 infection rates. These data will be used to:

- Identify spatial and temporal trends in COVID-19 infections throughout Utah.
- Identify new outbreaks in currently unaffected communities.

There are several potential outcomes of this work that can potentially help communities throughout Utah more efficiently and effectively respond to the pandemic, including:

- Efficient allocation of health testing and treatment resources.
- Development of local pandemic response recommendations.
- Early identification of future disease insurgences or new outbreaks in communities not already affected.

Survey Design

In general, background SARS-CoV-2 RNA will be collected from each facility once per week. Additional samples may be requested based on trends in wastewater RNA concentrations or confirmed COVID-19 infections in monitored sewersheds.

Routine samples will be picked up by Division of Water Quality (DWQ) staff or courier service on M-W (Table 1), with TH and F reserved for any additional data collections requested by health officials.

Samples will be delivered to University partners who will prepare and process the samples for subsequent genetic analysis (rapid qPCR) to quantify the concentration of SARS-CoV-2 gene copies in the sample. Sample results will be delivered to DWQ within 2-3 days of data collection.

DWQ will review the data and then normalize the results by flow (daily RNA load) and population (per capita daily loads). These results will then be posted to the internet using dynamic analytical and data visualization (e.g., dashboard of pilot investigation: <https://udwq.shinyapps.io/pilot-ww-virus-db/>). Trends observed will be regularly communicated to state and local health representatives.

Monday	Tuesday	Wednesday	Thursday
Table 1. Proposed schedule for routine sample collections.			
North	SL County Area	Southwest	Uinta Basin
Brigham City	Central Valley	Blanding	Ash Creek
Central Davis	Jordan Basin - G	Moab	Ashley Valley
Central Weber	Jordan Basin - P	Monticello	Daggett County
Hyrum	Magna	Price	Dutch John
Logan	Salt Lake City		Heber Valley
North Davis		Central	Roosevelt
South Davis - North	Snyderville – East Canyon	Fillmore	
South Davis - South	Snyderville – Silver Creek	Gunnison	
Tremonton	South Valley	Mona	
	Tooele	Moroni	
	UT County Area	Richfield	
	Orem		
	Payson	Southwest	
	Provo	Ash Creek	
	Santaquin	Cedar City	
	Spanish Fork	Springdale	
	Springville	St George	
	Timpanogos		

Detailed Facility Sample Collection Procedures

1. Each facility will collect a composite influent sample using their standard collection protocols and safety procedures.
 - a. For composite samples (preferred method) do your best to time the end of the composite sample as close to the sample pick up time as possible to minimize degradation of SARS-CoV-2 RNA. Be sure to record the date, and storage temperature.
 - b. For those who do not have a composite sampler, please collect a grab sample during the morning peak flow on the day of sample delivery. Record the inflow rate, storage temperature (method (e.g., on ice is an alternative) and date/time of grab sample collection.
2. Influent temperature. During the pilot investigation we learned that SARS-CoV-2 RNA degrades relatively quickly at higher temperature. We are



Figure 1 Example of bottle label.

interested in obtaining this information if it is possible to readily obtain. Please record the samples temperature at the start or end of the composite sample collection if possible. If you need equipment to collect this information, please contact DWQ.

3. Collect a subsample of approximately 1 L from the composite leaving approximately 1 inch head space, DWQ will provide sample bottles. Also, if applicable, record the total volume of the composite sample.
4. Ensure that the sample lid is firmly tightened and sanitize the outside of the bottle. For example, fully submerge the bottle in a freshly prepared 1:10 part bleach solution.
5. Refrigerate or place the sample on ice to minimize RNA degradation during sample labeling and documentation.
6. Complete the Chain of Custody (COC) paperwork (Chain of Custody Statewide Covid Study_7-1.xlsx). A second worksheet in this file contains assigned Facility ID and sample codes.
7. Completely dry the outside of the bottle and use an indelible marker (e.g., Sharpie) to label the side of the bottle with the following information (Figure 1):

Sample Number (see COC for codes) as: Type-FacilityID-MMDD (e.g., INF-HCWWTP-0417)

Facility Name (Facility ID)

Start Time: Date and Time the composite started (in the event that the sample was a grab sample, label as "GRAB SAMPLE, MM/DD/YYYY, 14:00")

End Time: Date and Time the composite ended or NA if it was a grab sample

Composite Volume

Average inflow rate or instantaneous inflow rate for grab samples (M gal/day)

8. Cover the label information with transparent packing tape.
9. Refrigerate the subsample or place it on ice next to the COC form. If wet ice is used to chill the sample, please place the COC form in a 1-gallon sealable (e.g., Zip-Lock) bag.

Communication Plan

A central challenge, for all involved, will be effectively communicating and responding to the data generated from these efforts in circumstances that are likely to be highly dynamic for everyone involved.

Observed trends in wastewater SARS-CoV-2 RNA concentrations will be relayed to state and local health authorities during weekly coordination meetings.

Local partners interested in receiving important updates should send DWQ their email address, along with their spatial scale of interest, specifically: only identified trends related to the sewershed of interest (i.e., specific treatment facility), or identified trends related to the local health district. We will do our best to make sure that you are informed of trends of interest as they unfold.

In some cases additional data collection may be needed to inform specific health responses. When these requests are made, DWQ will contact affected facilities via phone and email to determine whether or not accommodation of additional requests can be reasonably accommodated.

Financial Assistance

The primary interest of everyone involved in this effort is protecting the health of our neighbors. However, DWQ recognizes that the extra effort involved in this voluntary effort may result in a disproportionate financial burden on smaller communities. A small budget has been established to offset expenses for facilities that would otherwise be unable to participate. Those who have requested financial assistance should contact Emily Canton (ecanton@utah.gov) for reimbursement details.

DWQ Contacts

If you have any questions or concerns at any point through this collaborative effort, please do not hesitate to contact DWQ staff:

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