Virginia Wastewater Surveillance Program: Community of Practice Meeting

WWS Team
VDH | Office of Environmental Health Services
December 14, 2021
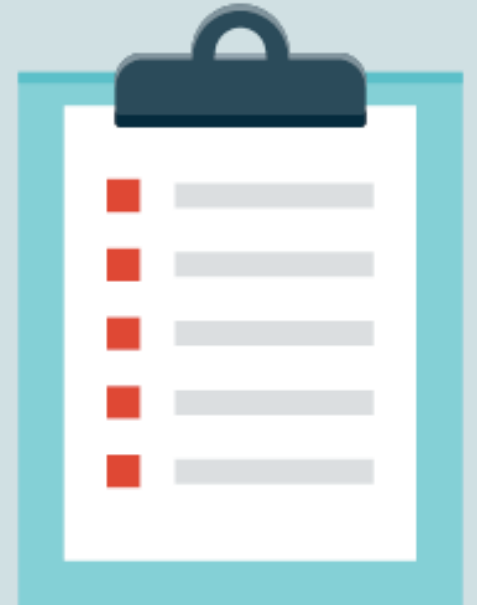
Agenda

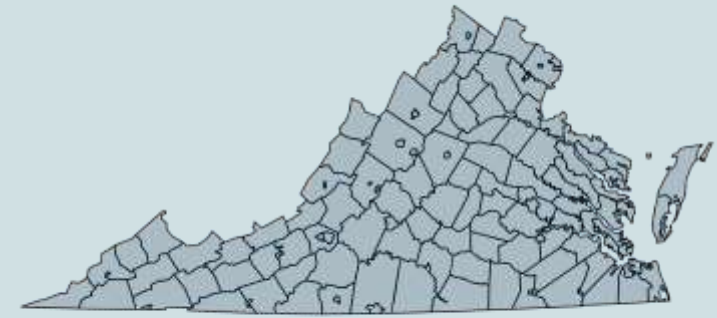1. Updates & Funding Opportunities (5 mins)

2. Topic(s) of Interest (45 mins):

   Case Study: Using WWS for our Department of Corrections

3. Open Discussion (5-10 mins)

Updates

Localized Projects

- **Chesapeake:** Project extension & expansion into other respiratory panels
- **DOC:** Speaker shortly!
- **FDA:** Sampling wastewater in areas with high population of agricultural/food workers (start: January)
- **K-12 school campus**: Started sampling at on-site treatment plant this week!
- **Roanoke:** Beginning HACH LuminUltra study
- **Others:** Will be accepting general applications soon

CDC NWSS Updates

- Wastewater data will be publicly-available *soon* (CDC COVID Data Tracker)

Sentinel Monitoring Updates
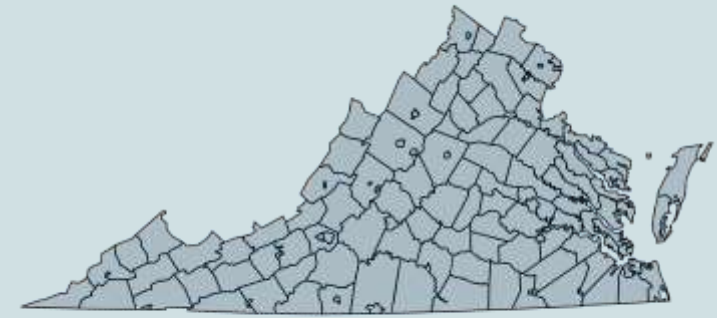
Weekly SARS-CoV-2 monitoring at influent to 25 wastewater treatment plants statewide started on September 13: 13 weeks!

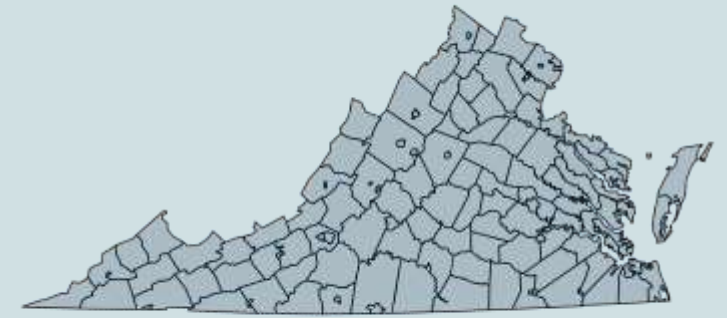❖ Weekly results sharing with:
  ○ Utilities
  ○ Health department partners
  ○ Environmental Health Managers
  ○ DCIPHER (in progress)
  ○ Future dashboard (in progress)
❖ **Variant Detection/Sequencing to begin soon!**

Funding Opportunities

❖ **Water Environment Federation (WEF) will be providing [free autosamplers](#) to at least 225 small utilities!**
   ○ Proposals are due Wednesday, December 29, 2021, at 5 PM EST
❖ **CDC Commercial Sampling: request for new utilities**
   ○ Must not be currently enrolled in NWSS
   ○ Sampling twice/week
❖ **Localized Projects (TBD)**
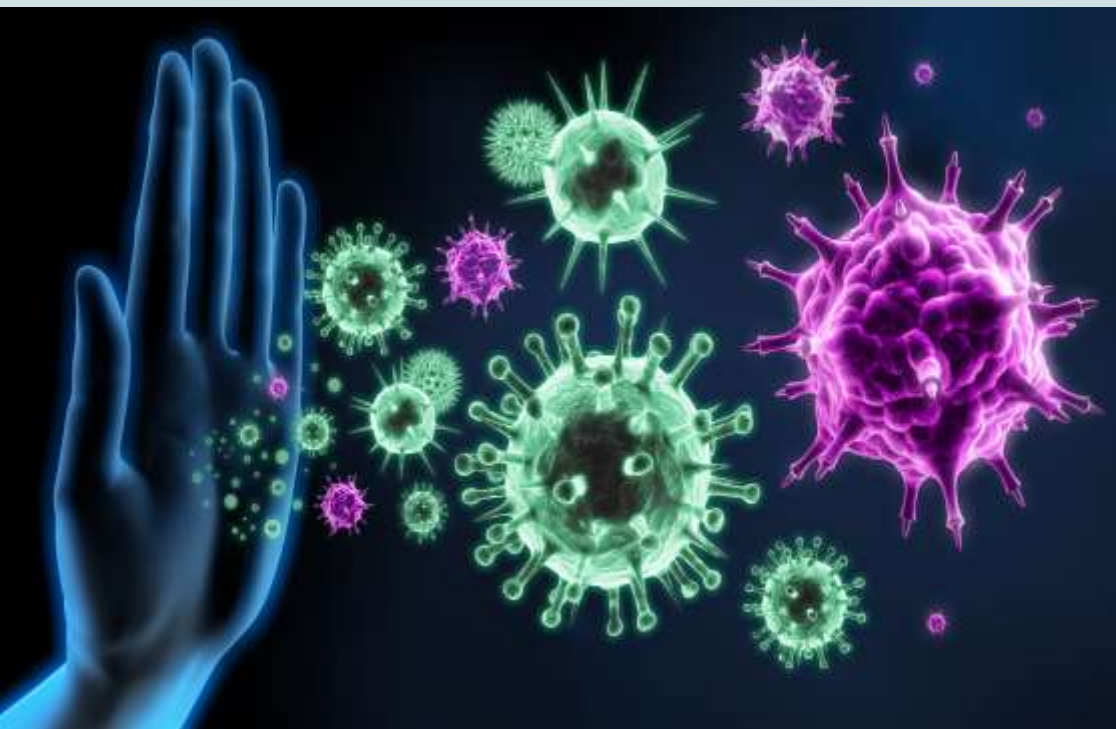
Targeted Wastewater Surveillance of Virginia Correctional Facilities as a Complementary Method for Screening of COVID-19

★ Meghan M Mayfield, MBA VCA
  Energy & Environmental Administrator
  Virginia Department of Corrections

★ Robert Tolbert
  Utilities Plant Administrator
  Virginia Department of Corrections

TARGETED WASTEWATER SURVELLIANCE IN
VIRGINIA CORRECTIONAL FACILITIES

As a Complementary
Method for Screening
of COVID-19

Presenters: Meghan Mayfield & Robert Tolbert

Points for discussion:

Topics and highlights

— Inception

— Benefits

— Challenges

— Implementation

— Partnerships

— Results

Overview of targeted wastewater surveillance at VADOC facilities

To detect SARS-CoV-2 RNA in wastewater samples and use the analytical results to assist the Department in the clinical decision making process regarding COVID PPT testing as well as other diversion methods for containment of infected staff and inmates.

- VADOC saw that HRSD had just completed a 26 week study of COVID wastewater surveillance. [COVID-19 Surveillance in Southeastern Virginia using wastewater-based epidemiology]

- Summer of 2020; confirmation of detection of, SARS-CoV-2 RNA in wastewater reported in Australia, China, France, Israel, Italy, Japan, Netherlands, Spain and the US .

- At that time there was no record of using a closed loop wasterwater system such as that from a congreagate care setting like corrections to run wastewater survelliance for COVID

- VADOC contacted HRSD to begin the testing of our facilities

- We started with 3 assay testing as well as dual composite/grab sample gathering from several locations. After several rounds we found that grab samples at predicted peak flow and N1 assay testing were as accurate as the CDC recommended 3 assay/composite sampling.

- Developed sampling plan and transport plan for 40 facilities, including JSA for employees and detailed individualized sampling plans due to differences in wastewater layouts

INCEPTION

October 2020

Getting the Ball Rolling

- VADOC contacted HRSD to begin the testing of our facilities

- We started with 3 assay testing as well as dual composite/grab sample gathering from several locations. After several rounds we found that grab samples as predicted peak flow and N1 assay testing were as accurate as the CDC recommended 3 assay/composite sampling.

- Developed sampling plan and runner plan for 40 facilities, including JSA for employees and detailed individualized sampling plans due to differences in wastewater layouts.

- We had to determine staffing needs and who would be running/delivering the tests to the labs within the required timeframe

- Form a Wastewater COVID team with VADOC Health Services to review results and make clinical decisions

The Decision Process

The Environmental Team and Health Services has to work very closely together to ensure we have reliable quantitative data from weekly wastewater testing for COVID

Sample wastewater, deliver to lab. Provide population and WW flow rates to lab

Lab reports both quantitative results and predictive results for number off infected individuals

VADOC COVID Wastewater team meets and goes over results. Facility Risk Factor report reviewed., data reviewed for trends or new information.

All internal data reviewed (# existing cases, State and county positivity rate, Staff # cases, etc.) and if data points to new or climbing cases PPT is performed

New wastewater sample pulled during PPT testing and then used to create statistical analysis/correlation

BENEFITS

Benefits For All

Proven Benefits

Non-Invasive Insight

Allows for the monitoring of the health of a large population without having to drill down, saving the Department staffing, time and funding.

Early Warning Signs

In the earliest stages we were only able to look at viral load and then trends for week to week. After getting comfortable with the data and honing the estimated population number infected estimates we were able to spot where we had potential issues at Institutions to make clinical decisions (turned into focused monitoring).

Focused Monitoring

VADOC was able to progress to looking at trends as well as the application of a estimate of cases tool developed by Raul Gonzalez from HRSD and further developed with the magnitude of our data paired with clinical testing data.

Cost Effectiveness

VADOC was spending between $60 and $200 per test for monitoring. PPT testing is between $60 and $160 per test.

Safety & Security

Allowed VADOC to continue to meet its mission for safety and security for inmates and staff. VADOC has over 11,000 employees as well as over 23,000 incarcerated inmates; therefore, detecting COVID early in these populations is critical. Many of these inmates are in sensitive populations such as infirmaries, geriatric settings, or dormitory housing where an outbreak of COVID could have serious consequences.

CHALLENGES

Making our Challenges Opportunities

Challenges Faced

Funding

Initially there was no funding source for the testing. We had to heavily pursue partnerships, reduced cost, cost sharing, grant applications, Federal applications, etc.

Staffing

The VADOC and the Infrastructure & Environmental Management Unit, like most State Agencies was feeling the pain of reduced levels of staff, high vacancies, vehicle shortages, as well as time shortages.

Data Comfort & Trust

We had to learn how to trust the data, build internal relationships with Units to trust each other's professional opinions within our core competencies

IMPLEMENTATION

Analyzing Analytical Results to Control Outbreaks

How Lab Results are Used

New Cases

Results may indicate positive unknown cases. This would act as a trigger to possibly iniatiate Point Prevalence Testing as determined by Health Services

Known Cases

Results are compared against known cases. Large discrepancies may initiate further Point Prevalence Testing

Trending Data

Weekly results can be trended to determine if the number of cases are increasing or decreasing. This provides evidence that the control measures to limit the infection rate are effective at each facility.
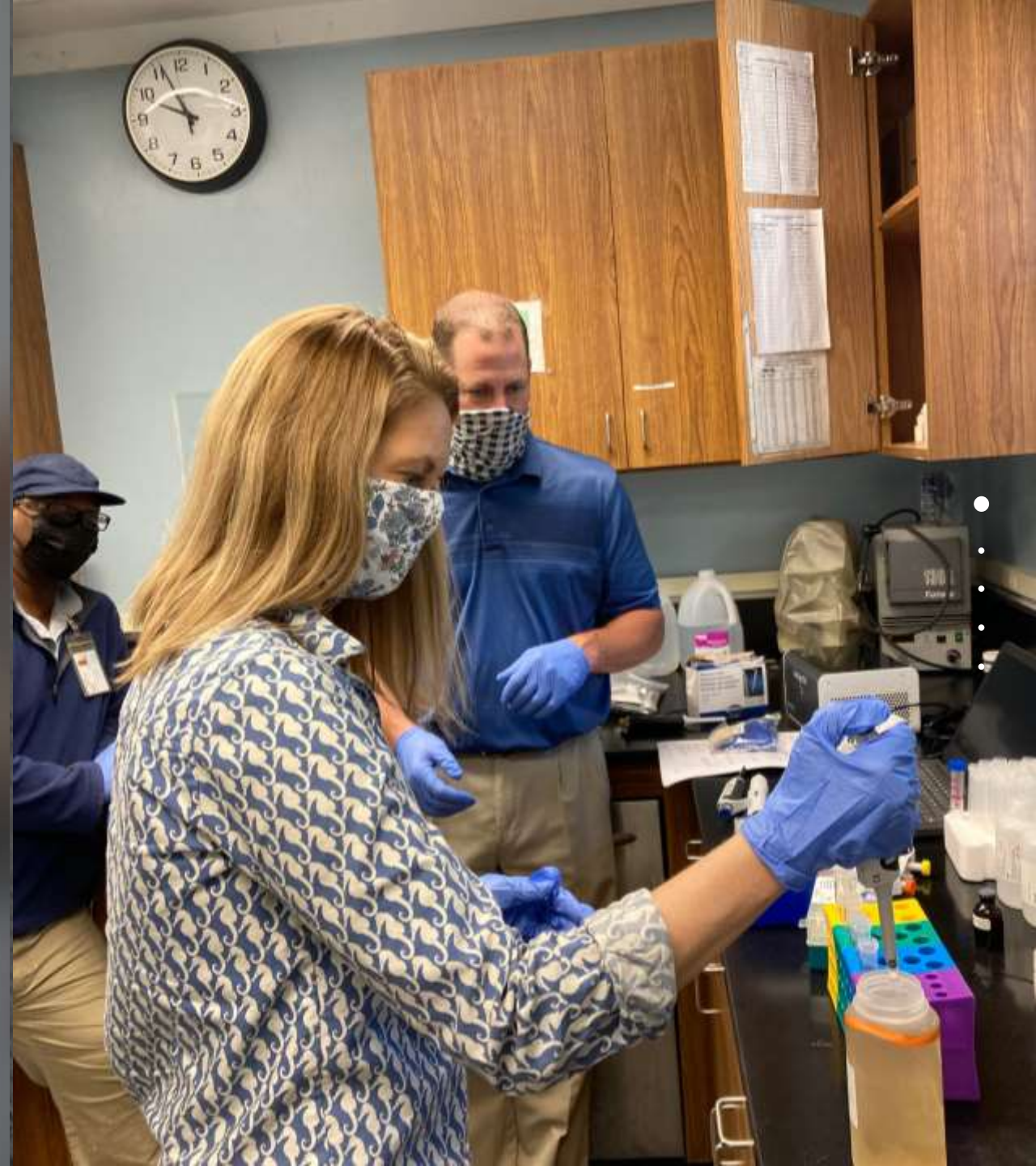
PARTNERSHIPS

Engaging our community and taking advantage
of available resources

VADOC as a collaborate and Innovative Agency

We began using wastewater as a predictive epidemiological tool at a time when this testing was in its infancy and only a few laboratories in the US were able to perform this type of testing. We used the available research and data in collaboration with our data and team to be one of the first locations, as well as one of the first correctional agencies in the United States, to use these data to develop reactionary clinical testing and quarantine requirements

- HRSD and Dr. Raul Gonzalez on the wastewater testing, cost sharing, and data exchange. Dr. Gonzalez was better able to refine his predictor tool using VADOC data and we had the advantage of being able to directly use the data and predictive number. Initially 20 sites, and then all 40 sites.

- Virginia Tech provided initial qualitative testing using research students and their internal laboratory for 20 of our sites.

- The VDH provided funding for a short period for the testing at HRSD in exchange for access to data and providing data to CDC for future use and use in studying

- The Water Environment Foundation with the CDC saw that VADOC was completing weekly laboratory testing for COVID survelliance and asked us to participate in a pilot program for the LuminUltra. LuminUltra has simplified the process, resulting in a easy-to-use test that gets you results in hours, with no specialized equipment or lab expertise required.

- Internal partners such as the Health Services Unit, Deolitte, Tulane

- DCLS State laboratory for transitioning with us from HRSD

LuminUltra Monitor

New technology being tested for accuracy in determining the concentration of the SARS-CoV-2 concentration in wastewater samples. VADOC was chosen to participate in this study with nine other companies in the US. VADOC was the only correctional department chosen.

How Does it Work

The LuminUltra process involves extracting and concentrating the RNA of the COVID virus. Based upon the amount of RNA extracted, the GeneCount software will give a qualitative result of the concentration of RNA genes that were extracted and able to be copied. Qualitative data would then have to be plugged into a trial formula to determine quantitative data which is an estimate of infected individuals. HRSD developed this formula.

Results & Locations

Results are being sent to the WEF and the CDC. Results are also compared against results received from HRSD. Bland, Deerfield, Fluvanna, State Farm, and St. Brides are currently conducting testing. with the LuminUltra.

POSITIVE RESULTS

December 2021

INFRASTRUCTURE &
ENVIRONMENTAL MANAGEMENT

Case Studies / Successes
VADOC has had tangible successes from the surveliance of the wastewater data

Nottoway 4/27/21
WW predicted: 2
PPT showed: 1

Red Onion 5/24/21 (first of the UK variant)
WW predicted 6
PPT showed: 3

Greensville 02/23/21
WW predicted: 10
PPT showed: 6

River North 04/05/21
WW predicted: 1553
PPT shoed: 88

Dillwyn 9/28/21
WW predicted: 36
PPT showed: 13

Statistical Significance

Data Validation

Sussex II

Simple linear regression results:

Dependent Variable: N_test (Copies/100mL)
Independent Variable: Reported daily cases (day of sample)
N_test (Copies/100mL) = -1397.0331 + 1207.781 Reported daily cases (day of sample)
Sample size: 45
R (correlation coefficient) = 0.53968002
R-sq = 0.29125452
Estimate of error standard deviation: 41183

Parameter estimates:

Parameter	Estimate	Std. Err.	Alternative	DF	T-Stat	P-value
Intercept	-1397.0331	6542.0507	≠ 0	43	-0.21354666	0.8319
Slope	1207.781	287.31797	≠ 0	43	4.203639	0.0001

Analysis of variance table for regression model:

Source	DF	SS	MS	F-stat	P-value
Model	1	2.9970003e10	2.9970003e10	17.670581	0.0001
Error	43	7.2929698e10	1.6960395e9		
Total	44	1.028997e11			

Statistical Analysis

Confirmed that wastewater lab results were a predictive indicator of infection rates and a clear early signal of positive cases to be confirmed through PPT testing.

Correlation of Data

Confirmed wastewater results were significantly inline with increased cases. Wastewater results showed a clear predictive function and there is a strong justification to use results as a control measure.
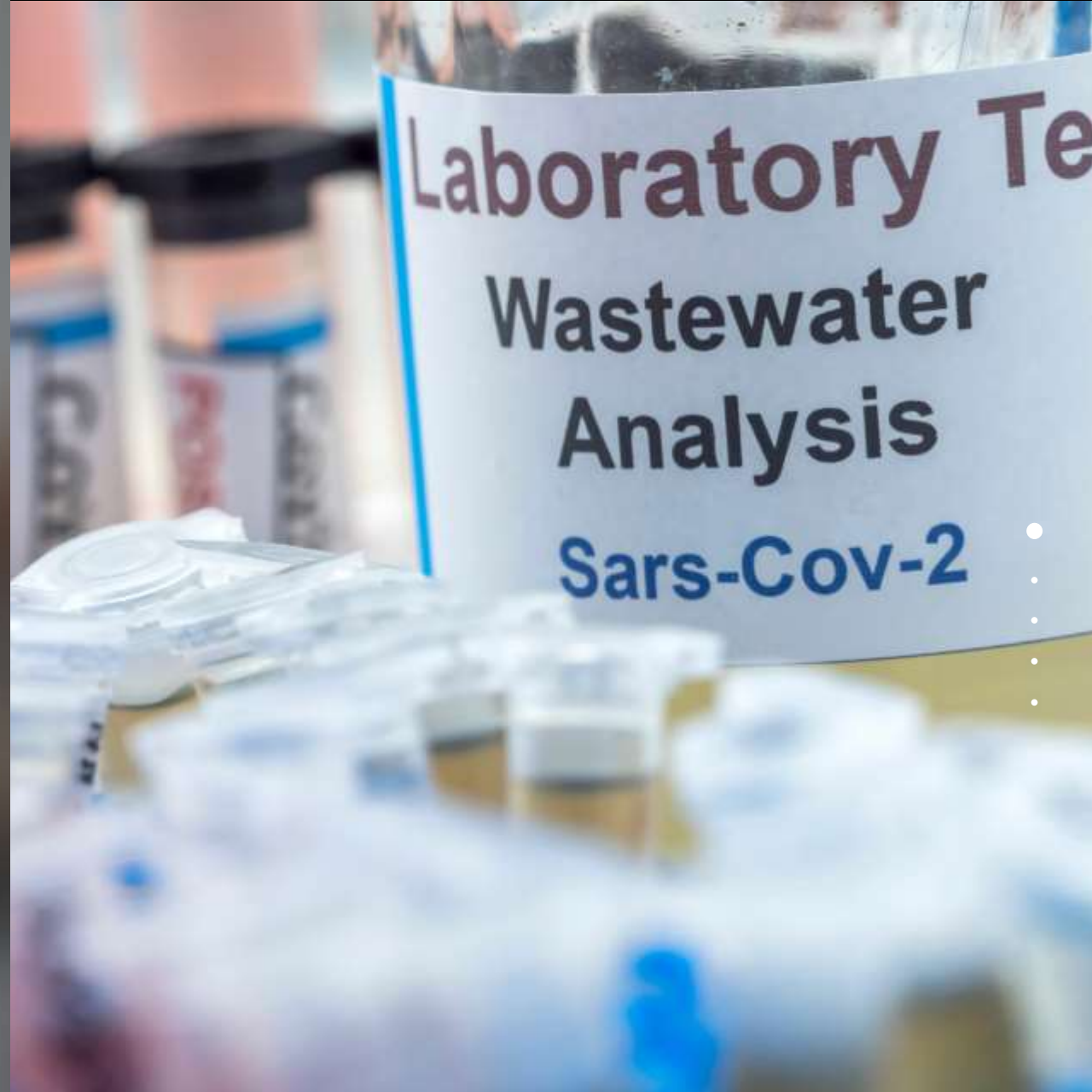
Questions?

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Laboratory Te
Wastewater
Analysis
Sars-Cov-2

Questions & Open Discussion

See you in the new year!
Happy Holidays to all!

Send inquiries / topics to:
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