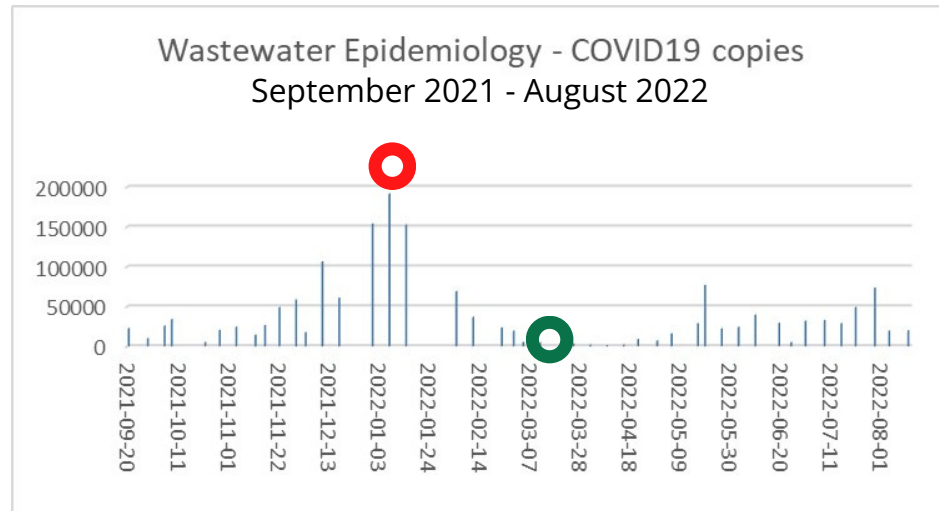


COVID-19 TESTING

- Fragments of the SARS-CoV-2 virus is shed in feces (this is not live virus), and concentrations of these particles in the sewage can be used to approximate the number of infected individuals in the testing area.
- Individuals begin shedding the virus days before physical symptoms occur, so the wastewater testing can act as an early warning for a community's COVID-19 trends.
- Traditional testing is limited to individuals who report their results. Wastewater testing looks at large population areas – and also includes information on asymptomatic individuals.



January 7, 2022 was the peak day for wastewater detection during this period (191,215 copies/L wastewater).

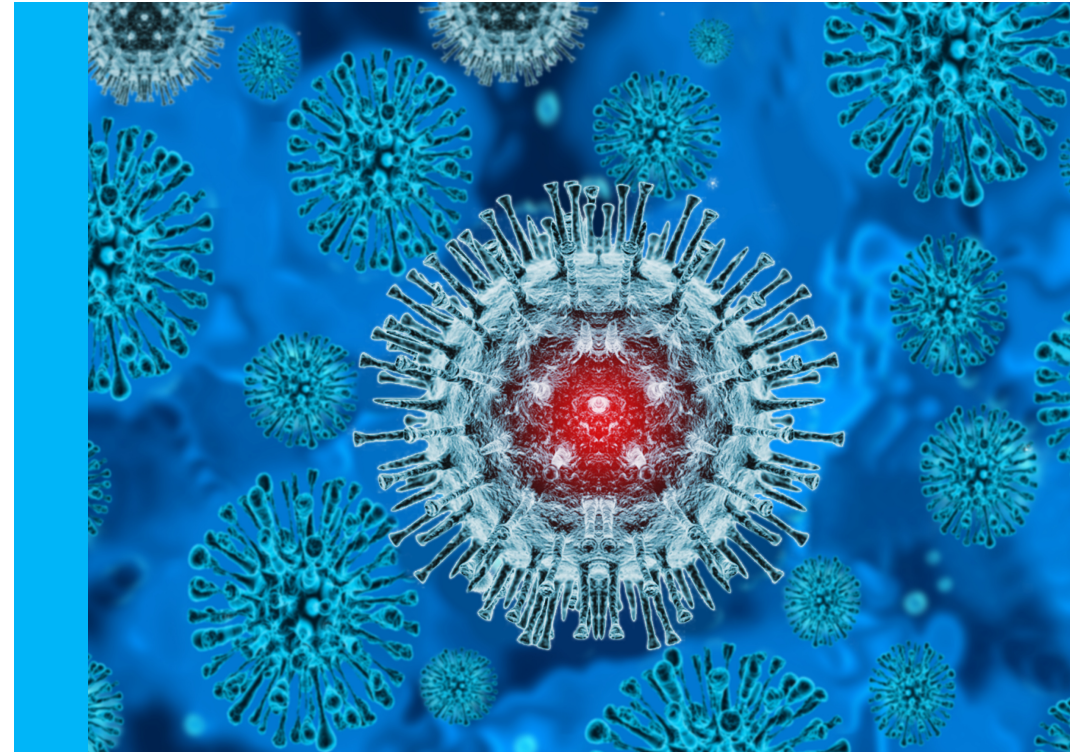
January 16-22, 2022 was the peak week for VDH reported cases in the RCAHD during this period (248.2 cases/100,000).

April 8, 2022 was the lowest day for wastewater detection during this period (1079 copies/L wastewater).

April 12-18, 2022 was the lowest week for VDH reported cases in the RCAHD during this period (2.5 cases/100,000).



WESTERN VIRGINIA
WATER AUTHORITY



WASTEWATER EPIDEMIOLOGY

Testing the wastewater from our community to identify pharmaceuticals, drug use and disease presence so that informed decisions can be made about public health

The Virginia Department of Health, with the CDC, has developed a National Wastewater Surveillance System that has a public facing dashboard.

<https://covid.cdc.gov/covid-data-tracker/#wastewater-surveillance>





ADVANCES IN TESTING

With better testing technology, traces of substances we put into our bodies (medications, illegal drugs, personal care products), and even virus particles that pass from our bodies into the wastewater stream, can now be detected.

µg/g = microgram per gram = part per million (ppm)

One ppm is equivalent to one minute in two years.

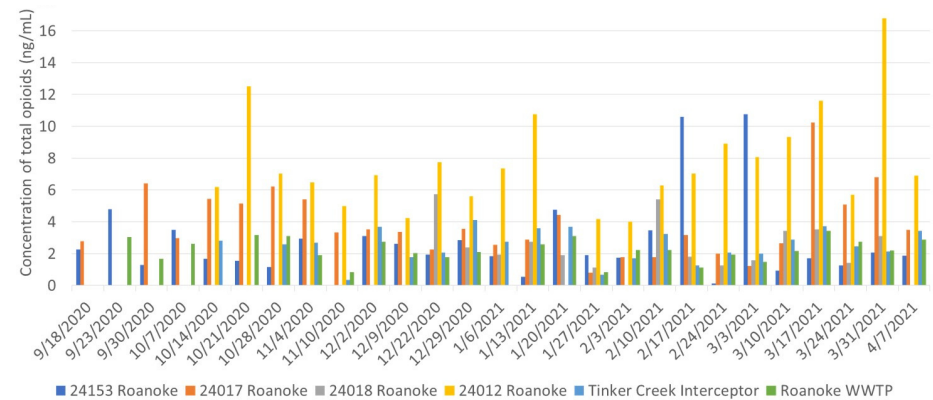
ng/mL = nanogram per milliliter = part per billion (ppb)

One ppb is equivalent to one second in 32 years.

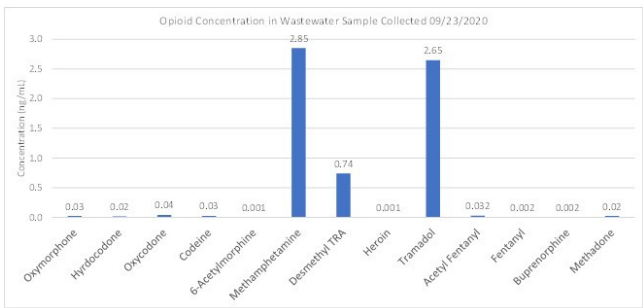
ng/L = nanogram per liter = part per trillion (ppt)

One ppt is equivalent to one second in nearly 32,000 years.

OPIOID TESTING



Man hole access point in Zip code 24017 – sample collected 9/23/2020



Dr. Kang Xia with the Center for Advanced Innovation in Agriculture at Virginia Tech tested for the presense of opioids in various sewersheds.

PHARMACEUTICAL TESTING

Pharmaceuticals and personal care products in an effluent sample taken June 2021 and June 2024 were tested by SGS Anxys Analytical Services as part of a VEE grant. The substances with the highest detections are listed below.

Substance	Usage	2021 Test Results	2024 Test Results
Metformin	Type 2 Diabetes medication	1150 ng/L	882 ng/L
Hydrochlororothlazide	diuretic, treats high blood pressure	407 ng/L	775 ng/L
Metoprolol	lowers blood pressure and heart rate		509 ng/L
Caffeine	stimulant	130 ng/L	280 ng/L
Atenolol	treats high blood pressure and chest pain	75.8 ng/L	171 ng/L
Valsartan	treats high blood pressure		143 ng/L
Theophylline3	Bronchodilator - relieves cough, wheezing and shortness of breath		141 ng/L
Meprobamate	treats anxiety		54.6 ng/L
2-Hydroxy-ibuprofen	metabolite of inbuprofen	38.7 ng/L	46.3 ng/L
Fluoxetine (Prozac)	antidepressant	57.2 ng/L	45.2 ng/L
Cotinine	an alkaloid found in tobacco and is also the predominant metabolite of nicotine, used as a biomarker for exposure to tobacco smoke	32.2 ng/L	41.4 ng/L
DEET	insect repellent		41.1 ng/L
Ibuprofen	anti-inflammatory drug	17.5 ng/L	37.2 ng/L
Oxycodone	opiod medicaiton used to relieve moderate to severe pain	7.26 ng/L	24.2 ng/L

THC and Cannabis compounds were also tested in the June 2021 and June 2024 samples. All substances were below the detection limit of the testing equipment.

Analysis	Method	Result	Unit
(-)-delta8-THC	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
(-)-delta9-THC	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
(±)-11-Hydroxy-delta9-THC (OH-THC)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
delta9-Tetrahydrocannabinolic acid (THCA)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Tetrahydrocannabinarin (THCV)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Tetrahydrocannabinarinic Acid (THCVA)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
(±)-Cannabicycol (CBL)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabichromene (CBC)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabichromenic Acid (CBCA)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabidiol (CBD)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabidiolic acid (CBDA)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabidivarin (CBDV)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabidivarinic Acid (CBDVA)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabigerol (CBG)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabigerolic acid (CBGA)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabinol (CBN)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Cannabinolic Acid (CBNA)	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Total THC	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Total THC equivalents: THC + (THCA x 0.877)	AFVAN-SLMR-0074 (LCMSMS)	<1	µg/g
Total Cannabinoid Content	AFVAN-SLMR-0074 (LCMSMS)	<1.0	µg/g
Total Cannabinoid equivalents: CBD + (CBDA x 0.877)	AFVAN-SLMR-0074 (LCMSMS)	<1	µg/g