Testing for Covid, Influenza and Respiratory Syncytial Virus (RSV) in an unlikely place

Wastewater Surveillance Program

Public health and clean water go hand-in-hand, especially in context Covid, Influenza and RSV. The City of Florence is and has been collaborating on a research project to track COVID-19 in sewage to help public health officials detect the presence and scope of the virus in a community. Using new analytical techniques, researchers are able to find evidence of the virus at the neighborhood scale, which could provide an early warning sign of the virus in a community.

The Oregon Health Authority (OHA) has and is working with Oregon State University (OSU) to collect and test samples of wastewater (sewage) from wastewater plants all over the state of Oregon. There are 30 wastewater treatment plants in Oregon participating in the program. Researchers are testing for traces of the SARS-CoV-2 virus that causes COVID-19. Samples are collected 1-2 times weekly from community wastewater treatment plants around the state. Wastewater monitoring for SARS-CoV-2 can be used to detect transmission trends as well as emerging variants at the community-level.

The information below is a summary and context communication regarding the wastewater surveillance program in Oregon from Christine Kelly, Ph. D. professor of Chemical, Biological and Environmental Engineering at Oregon State University.

What is RNA? The viruses we routinely test for in wastewater samples are RNA viruses. We search for these viruses based on specific regions, or sequences, in their RNA. RNA (ribonucleic acid) is structurally similar to DNA (deoxynucleic acid) except that it is usually single stranded rather than double stranded, contains an uracil base rather than a thymine base, and contains an extra oxygen molecule to make a ribose sugar. Viral RNA is replicated and used to produce viral proteins using the host cell's machinery.

Genomic Surveillance. From the CDC (https://www.cdc.gov/coronavirus/2019-ncov/variants/genomic-surveillance.html) "All viruses change (or mutate) as they replicate and spread in a population. Viruses that have RNA as genetic material, such as SARS-CoV-2 (the virus that causes COVID-19) and influenza, mutate much faster than viruses with DNA. Every time SARS-CoV-2 replicates, there is an opportunity for the virus to change. Many mutations do not affect the virus's ability to spread or cause disease because they do not alter the major proteins involved in infection and transmission.

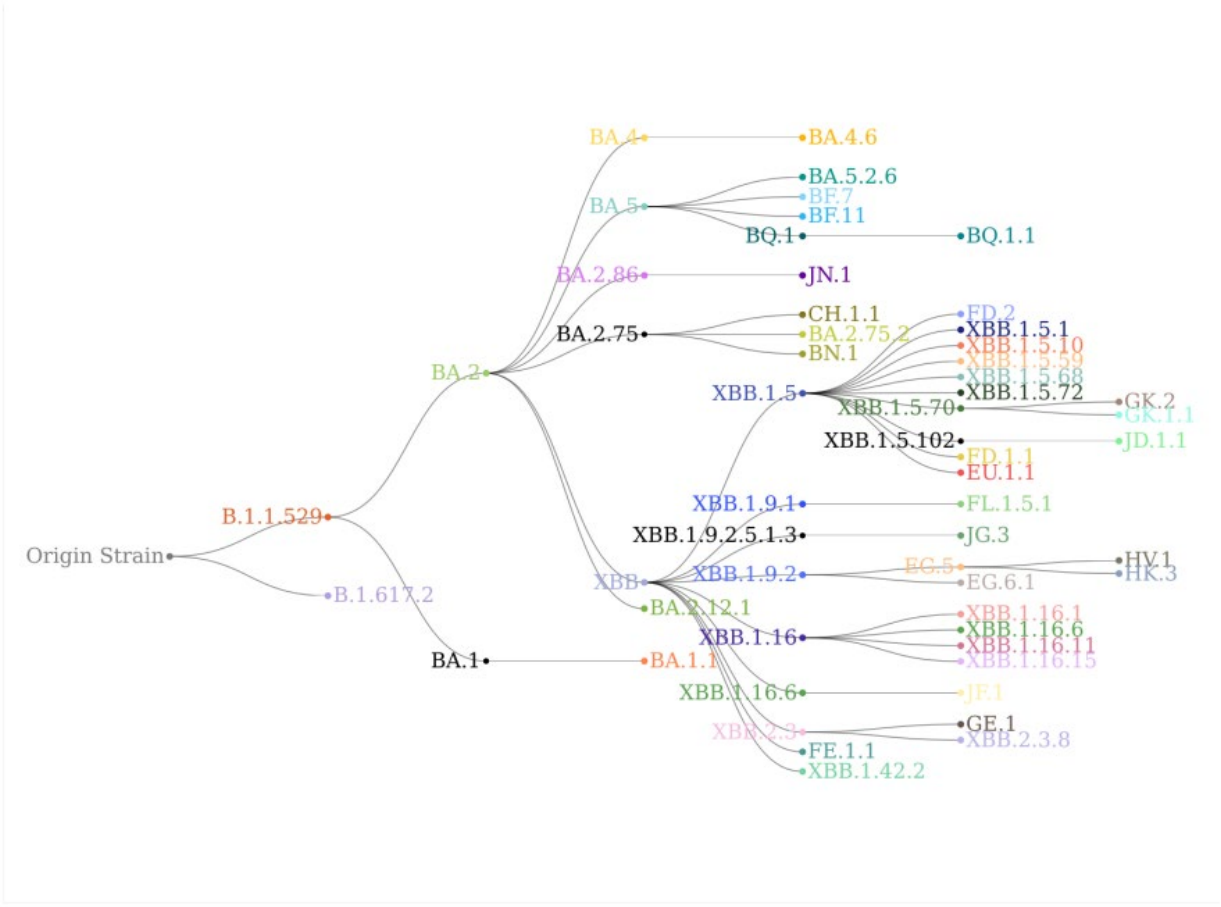
When one of these changes does affect the virus's ability to spread or cause disease, there may be a competitive advantage over the other lineages of SARS-CoV-2. Over time, certain lineages with these advantages become more prevalent and circulate in a population. When a lineage or group of lineages have characteristics that impact public health, CDC may classify them as a "variant of interest", or "variant of concern"."

OSU sequences all wastewater samples that have positive COVID-19 measurements above 4.0 log copies per liter of wastewater, and reports the variants found to OHA and NWSS-CDC where the information is included on the public dashboards.

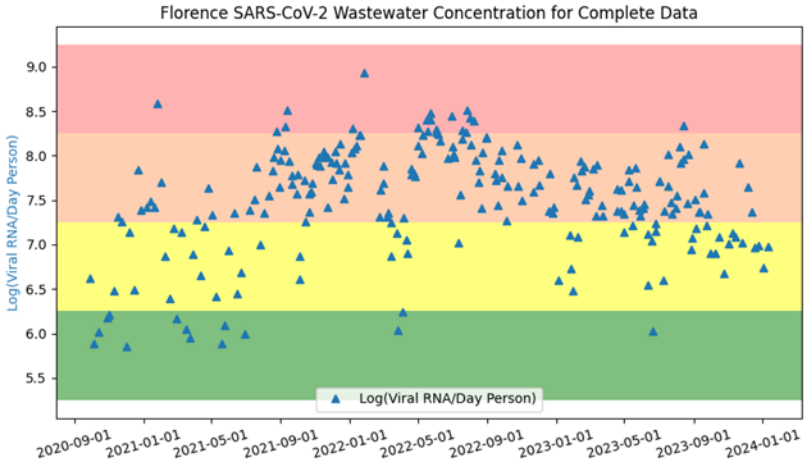
The JN.1 COVID Variant. The JN.1 Sars-CoV-2 variant has been detected in Oregon wastewater samples since October of 2023. Starting this month (January 2024), the JN.1 variant will be listed in its own column in results sent to the participating communities. According to the CDC:

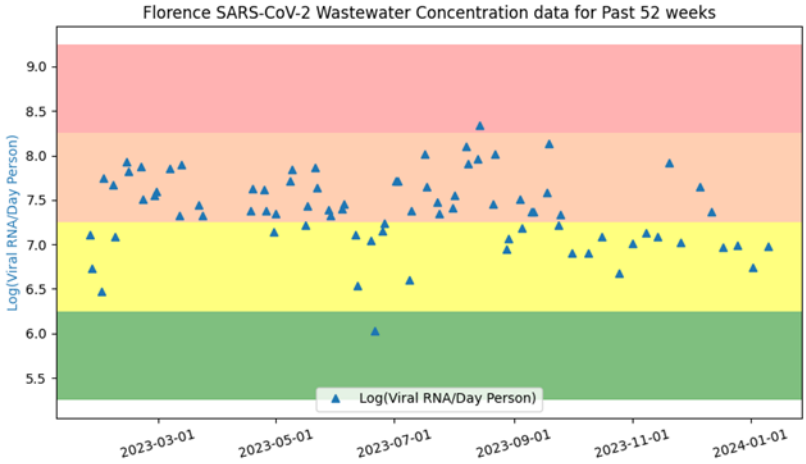
"JN.1 is closely related to the variant BA.2.86 …. Even though BA.2.86 and JN.1 sound very different because of the way variants are named, there is only a single change between JN.1 and BA.2.86 in the spike protein. JN.1 was first detected in the United States in September 2023….CDC projects that JN.1 will continue to increase as a proportion of SARS-CoV-2 genomic sequences. It is currently the fastest-growing variant in the United States. The continued growth of JN.1 suggests that it is either more transmissible or better at evading our immune systems. At this time, there is no evidence that JN.1 presents an increased risk to public health relative to other currently circulating variants."

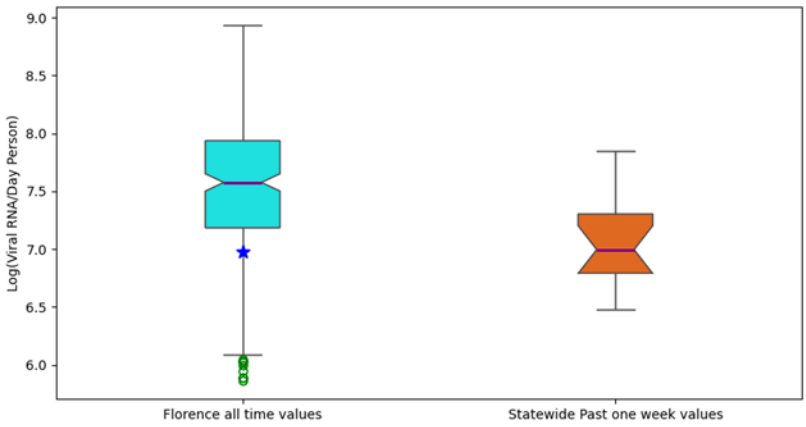
See the image below for frequently detected Sars-CoV-2 lineages, including JN.1:



The SARS-CoV-2 wastewater concentration results to date is represented in the chart below.


Florence SARS-CoV-2 Wastewater Concentration for Complete Data
Log(Viral RNA/Day Person)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
Log(Viral RNA/Day Person)
2020-09-01
2021-01-01
2021-05-01
2021-09-01
2022-01-01
2022-05-01
2022-09-01
2023-01-01
2023-05-01
2023-09-01
2024-01-01


Florence SARS-CoV-2 Wastewater Concentration data for Past 52 weeks
Log(Viral RNA/Day Person)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
Log(Viral RNA/Day Person)
2023-03-01
2023-05-01
2023-07-01
2023-09-01
2023-11-01
2024-01-01


Log(Viral RNA/Day Person)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
Florence all time values
Statewide Past one week values

The first chart is for the whole history of the data and the second chart represents the data for the past 12 months. As expected, the virus activity corresponds with the seasonality of the flu season. We saw a spike in virus activity in November/December and it has leveled out so far in January.

The third chart compares the current virus concentration with historical data for the City and for the past week in the state. The blue star is the most recent value of Log(Viral RNA/Day Person) in the City.

For more information on variant classifications, visit: https://www.cdc.gov/coronavirus/2019-ncov/variants/variant-classifications.html