

Minnesota Sea Grant-Supported Research Results 2020

Project: Monitoring the Presence of SARS-CoV-2 in Surface Waters Connected to Public Recreation Sites

September 2020

Background

In the summer of 2020, Minnesota Sea Grant funded a [research project](#) led by University of Minnesota Medical School Duluth campus scientist [Richard Melvin](#) to test for SARS-CoV-2, the virus that causes COVID-19, at [eight Duluth-area beaches](#). Water samples from each beach were taken each week (Friday through Sunday) from August through the end of September.* Tests of each water sample took about three to four days to process. The tests were used to tell us two things:

1. If there was detectable evidence of humans in the water. This is done by checking for the presence of a pepper virus (pepper mild mottle virus - PMMoV) that appears in the feces of people who have eaten peppers, which are present in many foods people eat. Animals do not typically eat peppers, so the presence of the pepper virus is how we tell people were in the water.
2. If there is any detectable levels of SARS-CoV-2, the virus that causes COVID-19, in the sampled water.

Results

Results from mid- to late-September, 2020, showed detectable levels of the SARS-CoV-2 virus in several locations. Test results from samples taken at all sites in early July through mid-September showed no detectable virus.

According to the U.S. Centers for Disease Control and Prevention, there is no known evidence that COVID-19 has been spread to humans through the use of [recreational waters](#). The CDC's guidance is to follow [safe swimming practices](#) along with social distancing and [everyday preventative actions](#) to protect yourself.

What we know

1. **Positive results September 11, 2020.** Tests run on samples of Lake Superior water taken September 11, 2020, at [Brighton Beach, 42nd Avenue, Leif Erikson Park, and Franklin Park \(Tot Lot at 13th Street\)](#) showed detectable levels of the SARS-CoV-2 virus at levels lower than what the researcher has seen in tests conducted on wastewater for a different project. The levels in the three Lake Superior samples were in the 100s of viral particles per liter of water, which is 10,000 to 100,000 fewer particles lower than what the researcher has seen in wastewater.
2. **Positive results September 18-20, 2020.** Tests run on samples of Lake Superior water taken September 18-20, 2020, at [42nd Avenue and the Lester River](#)* showed detectable levels of the SARS-CoV-2 virus. The virus levels in the 42nd Avenue sample were in the 1000s of viral particles per liter of water. The Lester River sample site was added after the September 11, 2020, positive results were confirmed.

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- 3. Positive results September 25-27, 2020.** Test run on samples of Lake Superior water taken September 25-27, 2020, at [Pine Forest Preserve, Lafayette Community Center, Franklin Park \(Tot Lot at 13th Street\), Leif Erikson Park, and Chester Creek*](#) showed detectable levels of the SARS-CoV-2 virus. The virus levels in the samples were in the 100s of viral particles per liter of water, except Leif Erikson, which showed near 1,000 viral particles per liter of water. The Chester Creek sample site was added after the Leif Erikson samples were confirmed to be positive.
- 4. Negative results.** Tests run on samples of Lake Superior water [from eight Duluth-area beaches](#) between July 4, 2020 and September 6, 2020 showed no detectable SARS-CoV-2 virus. Tests run on samples from the Pine Forest Preserve, Park Point Beach House, and Lafayette Community Center September 11-13 and 18-20 showed no detectable SARS-CoV-2 virus.

What we don't know

- 1. Method of transport to Lake Superior.** We do not know how the virus is entering Lake Superior.
 - a. One hypothesis was that people were transporting the virus on their bodies when they swam in the lake. This seems unlikely, given that the positive results have come when water and air temperatures have been cooler, and people were less likely to be in the water.
 - b. There was not much rain during the sampling period, so sewer overflows or overland runoff would not have been an expected source and method of transport.
 - c. Water tests from the Minnesota Point 15th Avenue Harbor Side Beach (UMD boat shed) did not show detectable levels of virus, so flow from the estuary or wastewater treatment plants would not have been an expected source and method of transport.
- 2. Why now?** We do not know why detectable levels of the SARS-CoV-2 virus are showing up in mid- to late-September when, presumably, fewer people are swimming in and around the beaches where water sampling took taking place. During the height of the summer swimming season (early July through mid-September) there were no detectable levels of the SARS-CoV-2 virus in the water samples.
- 3. Source(s).** We do not know if the detectable levels of SARS-CoV-2 in the Lake Superior water samples are an indication that the virus is now or is becoming more prevalent in the population and/or whether environmental conditions (e.g., lake currents, water temperature, water biogeochemistry, etc.) are contributing to the detectability of viral particles.
- 4. Bacteria monitoring.** Summertime bacterial monitoring of beach water by the Minnesota Department of Health ended September 7, 2020, so we do not have data that might indicate if the bacteria counts had also increased. [Bacteria monitoring](#) was conducted at the same locations as the water sampling for this project.

Next steps

- 1. *Continued monitoring.** Minnesota Sea Grant and UMN scientist Richard Melvin will continue this project, which was originally expected to end September 30, 2020. It is

important to continue this work to know if viral particles continue to increase, or if they decrease or remain the same.

2. **Environmental factors?** Minnesota Sea Grant is investigating how water moves in Lake Superior and the biology and chemistry of lake water to identify whether currents or water chemistry can help explain the origins of the now-detectable viral particles in the lake water samples.
3. **Minnesota Department of Health.** Minnesota Sea Grant has shared these results with the Minnesota Department of Health.