



COVID-19 analysis in wastewater

Studies have shown that SARS-CoV-2 is shed in the stools of individuals within three days of infection. This timeframe is much faster than the time taken for people to develop symptoms severe enough for them to seek medical attention and get an official diagnosis, a process that could take anywhere up to two weeks or more.

Wastewater streams are therefore a gold mine of critical information capable of providing better “real-time” estimates for how widespread the coronavirus is in comparison to results from clinical samples. Wastewater surveillance can also account for those who have not been tested or are asymptomatic thereby providing a more thorough and valuable insight into the prevalence of COVID-19¹.

Routine wastewater surveillance can therefore be used as a non-invasive early-warning tool to alert of new or previously undetected COVID-19 infections, clusters or hotspots.

ALS has recently developed in collaboration with the Water Research Australia ColoSSoS project, a robust methodology for the analysis of COVID-19 in wastewater.

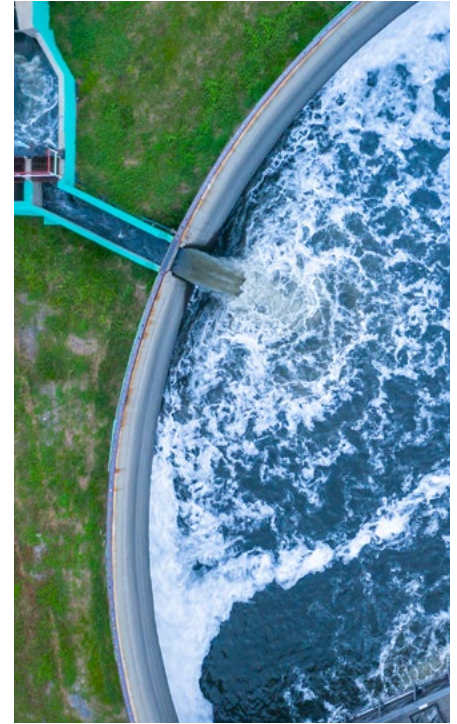


Methodology

The method targets two genes, the N gene and ORF gene and is specific to the SARS-CoV-2 strains. To perform the analysis, the water sample is first concentrated by membrane filtration. Total nucleic acid is then extracted using robotic extraction systems and subjected to quantitative reverse-transcription real-time PCR analysis to detect and quantify the concentration of the two target genes. The final result is reported as copies/mL in the wastewater sample.

QC samples and stringent quality checks along each step of workflow ensures that output data meets the highest quality standards. This test approach is rapid, sensitive, uses small sample size and has large sample throughput capabilities.

Currently all Australian based analysis is conducted in Melbourne.



Industry applications

COVID-19 analysis in wastewater can be applied to all forms of wastewater including sewage, effluent and industrial wastes. Some of the water industry related applications are:

Public health

Identification and quantification of COVID-19 in localized wastewater treatment systems to track the course of the pandemic, identify hotspots, identify previously unknown infected localities and potentially predict outbreaks. Routine surveillance could be conducted on central WWTPs and targeted high density living and working sites such as hospitals, apartment blocks, aged care facilities, schools and prisons.

Business continuity and Employee safety programs

Ensuring continuity of business and the safety of an organisation's workforce is critical for immediate and long-term success. For those industries or business's that operate stand-alone WWTPs not connected to municipal sewer systems, implementing an in-house COVID-19 surveillance program will provide added risk mitigation strategy complimenting other contingency plans.

Examples of industries and business's where surveillance would be invaluable are:

- Mine sites.
- Defence/Military installations.
- Other remote sites such as rail yards.
- National parks
- Resorts, caravan parks & camping grounds.

Routine monitoring programs can provide the confidence that sites and employees are free from infection thereby ensuring business security and employee safety. Should COVID-19 be detected this could activate workforce testing and contract tracing to minimise impact of potential widespread infection and site shutdown.

These surveillance programs could potentially identify emerging or re-emergent outbreaks, discover asymptomatic infections and potentially validate COVID-19 suppression within a community or workforce.

Sampling requirements

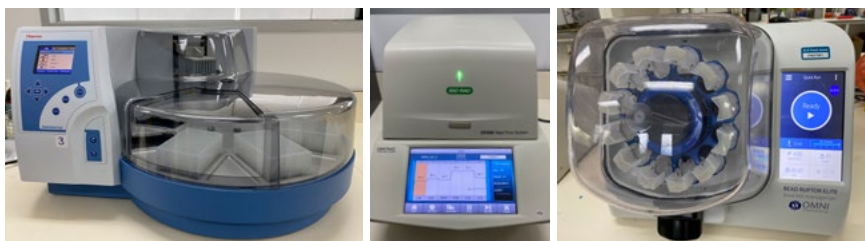
Samples can be taken from the influent of wastewater treatment plants or directly out of sewer transfer pipelines. Sampling can be performed via in-situ autosamplers for timed event sampling across a 24/7 period or individual, time scheduled or adhoc grab samples. Pipeline samples should be sampled via confined space entry techniques to ensure sampler safety.

Holding time	3 days for samples stored at 4°C ± 2°C.
Turnaround time	2-3 days
Sample volume	1 x 250mL plastic bottle
Sample shipping & storage	Transport sample on ice or in a refrigeration unit.
Limit of Detection	<3.3 copies/mL

ALS recommends that clients should contact their respective local state government Health Department or equivalent to seek advice on sampling, guidance on data evaluation and subsequent protocols/plans should a positive detection be reported.

For further information please contact your local ALS client services team.

References: 1. <https://www.nature.com/articles/d41586-020-00973-x>



ALS provides a wide range of specialised testing services for the water and health industries.

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