

Monitoring biological parameters in wastewater

Spotlight on samplers for monitoring SARS-CoV-2

Objective

- Real-time monitoring of regional prevalences within large populations
- Early detection of hot spots
- Cost-effective analysis of large populations in addition to individual testing

Challenges

- Representative sampling
- Increased number of samples
- Large volumes/low concentration
- New analysis of a microbiological parameter

Solution

- Automated and monitored 24-hour mixed sampling for reproducible quality
- An unbroken cold chain for stable virus RNA concentration in the sample
- Efficient enrichment enables low detection limits
- Automated nucleic acid extraction minimizes manual workload
- From sampling to final result in just a few hours
- Detection is based on highly specific real-time PCR



The analysis of wastewater for SARS-CoV-2 can provide valuable information on the occurrence of the Covid-19 infection in the catchment area of a wastewater treatment plant. The first pilot projects have already been launched in the USA and Australia for example. A comprehensive monitoring system was set up in the Netherlands as early as March 2020. The European Union published a recommendation to establish systematic surveillance of SARS-CoV-2 and its variants in wastewaters in all EU member states. Member States are strongly encouraged to put such a system in place no later than 1 October 2021.

The first key component of a monitoring system is an automatic sampler such as Liquistation CSF48, which automatically collects the required 24-hour mixed samples at the inlet to the wastewater

treatment plant. In addition, the EU Recommendation requires that sampling should be carried out in parallel in specific locations of the wastewater collecting network among vulnerable communities in order to facilitate targeted monitoring of the infection occurrence based on analysis of the wastewater. The Liquiport CSP44 mobile sampler is particularly suited to this task.

The stationary sampler Liquistation CSF48 is optimized for temperature control and to ensure an unbroken cool chain. High-quality insulation of the sampling room, integrated temperature logging and long-lasting refrigeration systems all guarantee a high level of safety and low maintenance requirements. Thanks to the proven coating of the refrigeration systems, the Liquistation CSF48 offers ultimate corrosion resistance.

Real-time PCR-based detection workflow

1. Sampling



Inlet measurement with Promag W 400 electromagnetic flowmeter for flow-controlled sampling



Fully automated sampling with Liquistation CSF48 (over an individually defined period of time, e.g. 24 hours)

- Flow- and time-controlled sampling
- Exceptional operating life of the cooling module and insulating area
- Menu-base programming
- Remote maintenance via secure VPN



The Liquiport CSP44 portable automatic sampler is designed for flexible use at any sampling point either as a stand-alone battery-operated device or connected to the mains

2. Laboratory sample preparation and qPCR analysis



Efficient enrichment of the target organism by means of filtration (third-party provider). Homogenization of the sample material is carried out using SpeedMill PLUS from Analytik Jena GmbH



Reproducible extraction of DNA and/or RNA through the combined use of the innuPREP AniPath DNA/RNA Kit – IPC16 and InnuPure C16 touch (both from Analytik Jena)



Highly sensitive target detection using qTOWER3 series real-time PCR thermal cyclers from Analytik Jena, combined with specific real-time PCR assays (from third-party suppliers, e.g., the IDEXX Water SARS-CoV-2 RT-PCR test)

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