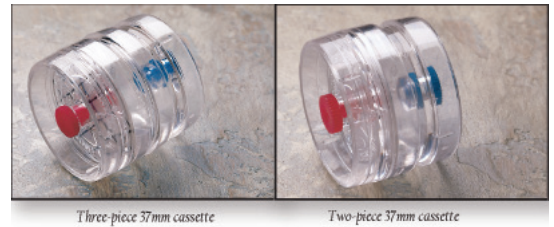


COVID-19 Air Sampling Recommendations

Based on the most current research available for air sampling of the coronavirus called SARS-CoV-2, a.k.a COVID-19, a limited number of methods have proven to be effective in capturing positive results. **The National Institute of Occupational Health and Safety (NIOSH) has reviewed various filters for sampling airborne pathogens and recommended the use of PTFE for immunological assays and polymerase chain reaction (PCR).** This is mostly due to PTFE filter structure, which does not interfere with biochemical tests and the target viruses, and hence can be easily eluted from the membrane (Lindsley et al., 2017). It should be noted that many of the studies performed have been in hospital settings with known viral loads present, and the most prevalent non-viable sampling with positive results has come from cassettes loaded with PTFE filter media.

Filter cassettes are generally used in two types, including 2-Stage and 3-Stage cassettes. There are inlet and outlet ports in the cassettes for entering and exiting air after passing through the filter. The 2-Stage cassette can only be used for closed-faced sampling, while the 3-Stage cassette is used for the both closed- and open-faced sampling. Several studies have used polytetrafluoroethylene (PTFE) membrane filters for sampling SARS-like viruses (Booth et al., 2005).



Cyclone samplers have also been used for sampling of SARS-like viruses. The cyclones were used for 8 hours and high flow rates for sampling such viruses. Moreover, NIOSH method 0600 has recommended the use of cyclone prior filter for removing the non-respirable particles from the target bioaerosols (Lindsley et al., 2017). Some studies have reported that the cyclone methods are very destructive for collecting viruses. However, PCR analysis can detect non-infectious viruses, and therefore there is no need to trap infectious form of the airborne virus.



A recent study has used cyclone along with filter cassette containing a 37-mm diameter PTFE filter with 3 μm pore sizes for sampling and determination of SARS-Cov-2 viruses in the indoor air of hospital. In this case, the cyclones were used prior to the filter cassette containing PTFE filter membrane for the distribution of the collected particles in three size fractions including $>4 \mu\text{m}$, $1-4 \mu\text{m}$ and $<1 \mu\text{m}$ (Chia et al., 2020). Physical damage of the viral nuclei structure, caused by the physical impact actions of cyclones during sampling, is considered a main limitation for collection of viable samples.

Most current studies with positive test results have used gelatin filters, PTFE filters and cyclones. No positive test results were observed in the use of impinger-like samplers for SARS-like viruses. It seems necessary to consider a high sampling volume for trapping SARS-CoV viruses in contaminated air. RT-PCR and TEM were commonly used for the detection of SARS-like viruses (Rahman et al., 2020).

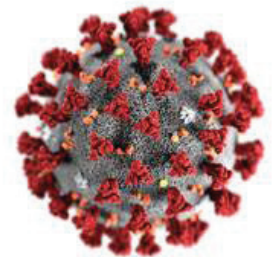
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See next page for Solutions and Methodologies.

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Sensidyne Product Solutions

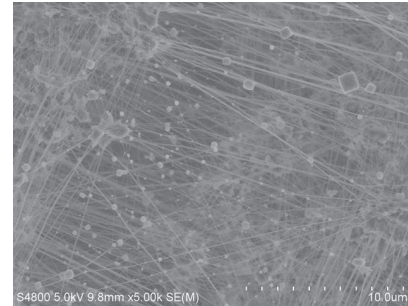


**GilAir Plus
Personal Air
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20-5000 cc/min. in constant flow mode. Options available: Bluetooth, Standard Temperature & Pressure (STP) correction, Data-Logging.



**BGI GK2.69
37mm Cyclone**



Filter Media

Photomicrograph of 300 nm particles collected on a 3 micron PTFE filter.



Gilibrator 2 Wet Cell Calibrator

Primary wet cell calibrator with low, standard, and high flow bubble cells from 1 cc/min to 30 LPM.



**BGI-4L Higgins-
Dewell Cyclone**



Gilibrator 3 Dry Cell Calibrator

Primary dry cell calibrator with *StablFlow*TM provides constant low back pressure. Low, standard, and high flow dry cells, from 5 cc/min to 30 LPM.

Air Sampling Methodologies

While there is not a consensus for specific flow rates and collection medium, previous testing has shown positive results for air samples collected at flow rates between 2 and 5 liters per minute (LPM) on polytetrafluoroethylene (PTFE) membrane filters. If using a size selective cyclone, the flow rates must be specific to the desired particle diameter cut rate for each particular device.

Due to low airborne viral concentrations in most settings, Sensidyne recommends collection of total aerosolized particulates collected with a closed-face 3 piece, PTFE filter cassette. The Filter media shall be calibrated in line with the GilAir Plus pump and the Gilibrator Calibration unit. The flow rates shall be set on the pump between 2 and 5 LPM depending on the length of the sampling time. For optimal results, we recommend collection of 960 to 1560 liters of air.

2 LPM	for	8 -13 hours.
3 LPM	for	5.5 - 8.5 hours
4 LPM	for	4 - 6.5 hours
5 LPM	for	3.2 – 5.2 hours

If using the **BGI-4L Cyclone**, the <4µm respirable fraction, flow rate should be set at 2.2 LPM for 8-13 hours.

If using the the **GK 2.69 Aluminum Cyclone** at 1.6 LPM, <10µm Thoracic fraction, run for 10-15 hours. This cyclone could also be used at 4.2 LPM for the <4µm respirable fraction, run for 4-6 hours.

All samples should be shipped with ice packs and refrigerated at the laboratory.

