

# [Summary] SARS-CoV-2 in hospital air as revealed by comprehensive respiratory viral panel sequencing

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## Summary

The presence of severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2) in hospital environments has become the most significant pandemic of our lifetime. Intra-hospital transmission has led to additional outbreaks, and makes health care workers susceptible to further infection. The biggest challenge in identifying SARS-CoV-2 in aerosols is the low viral load rendering it challenging to be detected by routine procedures, like RT-PCR.

The respiratory viruses and SARS-CoV-2 present at low copy numbers were successfully detected with Celemics' CRV panel with higher sensitivity compared to the conventional method, RT-PCR. The result suggests that using NGS-based CRV panel on a large volume aerosol sample was a valuable tool for detecting SARS-CoV-2 in indoor aerosols of health care settings. Owing to its higher sensitivity, it can be employed as a surveillance strategy in the post COVID times to act as an early warning system to possibly control future outbreaks.

## Keywords

Group	Keywords
Research Fields	SARS-CoV-2, Environmental Science, Virology, Life Sciences
Research Topics	SARS-CoV-2, Respiratory virus, Hospital infection, Surveillance, Environmental DNA (eDNA)
Related Methods	Next Generation Sequencing (NGS), Targeted sequencing service, Target enrichment kit, Bioinformatics solution, RT-PCR

## Purpose of the Study

- To assess efficacy of comprehensive respiratory viral panel (CRV Panel) sequencing and RT-PCR for low-level identification of SARS-CoV-2 and other respiratory viruses in indoor air.

## What Has Celemics Contributed to the Study?

- The Celemics target enrichment kit, Comprehensive Respiratory Virus Panel (CRV Panel), was used for hybridization capture of multiple (n=39) viruses and showed highly sensitive capture performance.
- RT-PCR detected SARS-CoV-2 in only 6 out of 15 locations (40%), whereas the CRVP captured reads at 13 of 15 sites (86%).
- Using the CRV panel, the respiratory viruses including human adenoviruses, RSV, influenza B, and non-SARS-CoV-229E were also detected.
- Multiple variant types such as SNVs, Indels, and Rearrangements were successfully detected and analyzed with CRV panel.
- "RT-PCR although powerful in terms of rapid turnaround time and quantification, is limited in sensitivity ... The CRVP was, however, sensitive enough to pick SARS-CoV-2 from locations that tested negative by RT-PCR."

- “Thus, CRVP would be a useful tool for monitoring the presence of SARS-CoV-2 in both hospital and non-hospital settings.”
- To convert the extracted total RNA to complementary cDNA, the Celeemics cDNA (Celeemics, Korea) Synthesis Kit and CeleMag™ Clean-up Beads were used.

## Description of Comprehensive Respiratory Virus Panel

### Comprehensive Respiratory Virus Panel

The CRV Panel is designed for the comprehensive analysis of clinically significant respiratory viruses that are widely assessed by medical institutions around the globe. The panel validation test with clinical samples showed superior whole genome sequencing (WGS) success rates compared to other competitor kits on the market. The panel includes all required kits including the RNA-to-cDNA Kit and cDNA-to-Captured Library Kit. Our customers can receive stand-alone bioinformatics software, ‘Celeemics Virus Verifier’, which provides in-depth analysis information while ensuring the security of client sequence information.

Target Viruses	9 types / 39 virus strains, including SARS-CoV-2
Target size	706 kb
Mutation type	Viral variants detection, Viral mutation (SNV, Indel) from generated Whole Genome Sequence
Sample type	Upper respiratory tract, Nasopharyngeal, Oropharyngeal specimens, and others
Kit composition	Provides all required reagents, including RNA to cDNA kit, cDNA to captured library kit, and bioinformatics software
Platform	All sequencers from Illumina and Thermo Fisher
Bioinformatics pipeline	Provides stand-alone bioinformatics software ‘Celeemics Virus Verifier’ (FASTQ to Report)

## Related Products and Services

1. Celeemics Target Enrichment Panels
  - Comprehensive Respiratory Virus (CRV) Panel
  - African Swine Fever Virus (ASFV) Panel
2. Bioinformatics: Celeemics Virus Verifier
  - Receive stand-alone bioinformatics SW
  - Protect your easily-compromised data with our EU-GDPR compliant cloud system
3. Celeemics Double-Stranded cDNA Synthesis Kit
  - Includes all components required for double-stranded cDNA synthesis from RNA fragmentation
  - Allows for the cDNA synthesis even from low amounts of RNA samples with high accuracy