SARS-CoV-2 emitted in Respiratory Aerosols through Singing, Talking, Breathing

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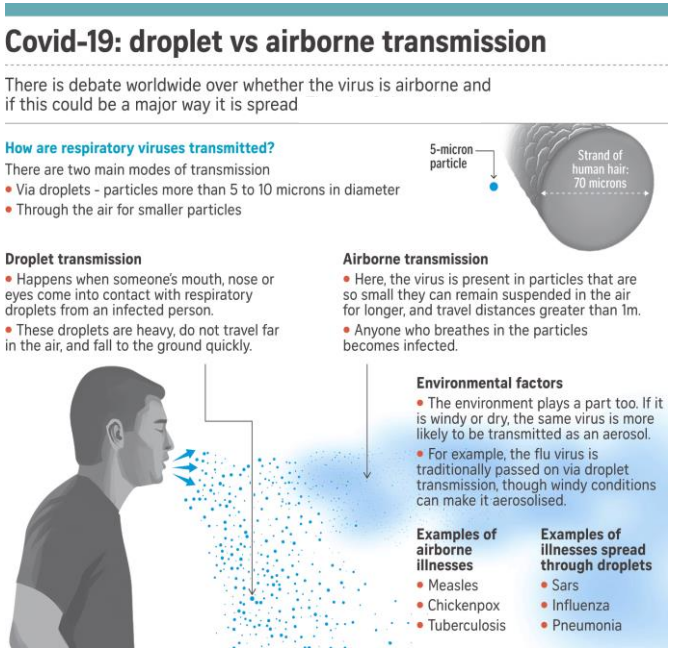
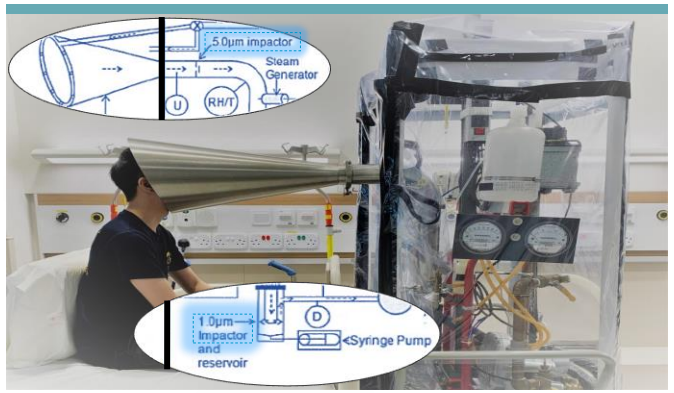
BACKGROUND

Multiple SARS-CoV-2 superspreading events suggest that aerosols play an important role in driving the COVID-19 pandemic. However, the detailed roles of coarse (>5μm) and fine (≤5μm) respiratory aerosols produced when breathing, talking, and singing are not well-understood.



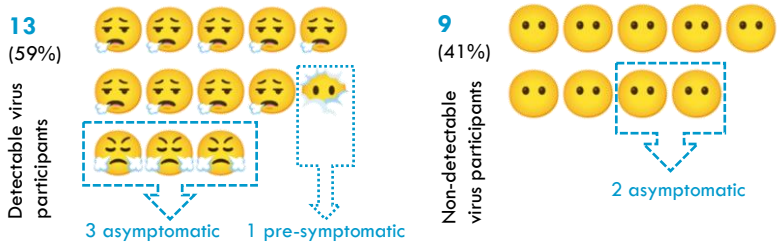
METHODS

Using a Gesundheit-II exhaled breath collector, we measured viral RNA in coarse and fine respiratory aerosols emitted by COVID-19 patients during 30 minutes of breathing, 15 minutes of talking, and 15 minutes of singing.



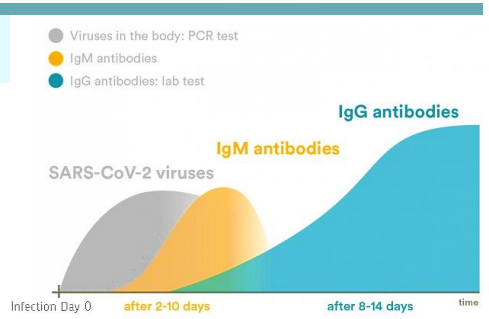
RESULTS

Among the 22 study participants, 13 (59%) emitted detectable levels of SARS-CoV-2 RNA in respiratory aerosols, including 1 pre-symptomatic patient and 3 asymptomatic patients.



The largest proportion of SARS-CoV-2 RNA copies was emitted by singing (53%) , followed by talking (41%) and breathing (6%) - the median number of viral N gene copies generated during singing was 713.6 (IQR 135.1–1216.1), compared to 477.9 (IQR 234.5–1356.6) for talking, and 63.5 (0–227.6) for breathing (Kruskal-Wallis test, p=0.026).

Patients earlier in illness were more likely to emit detectable RNA (median day of illness of 3 versus 5, p-value=0.025). Overall, fine aerosols (≤5μm in diameter) constituted 85.4% of the viral load detected in our study.



CONCLUSION

SARS-CoV-2 can be aerosolized in the absence of coughing, sneezing, and aerosol-generating medical procedures. Fine respiratory aerosols might play an important role in community transmission of SARS-CoV-2, which is in agreement with other expert views suggesting that SARS-CoV-2 transmission is airborne, and could explain the difficulty in containing the virus. The results support calls for proper respiratory protection, airflow patterns, ventilation, filtration, and safe airborne disinfection, particularly in indoor environments, to reduce exposure to SARS-CoV-2 in fine aerosols.