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Characteristics of SARS-CoV-2-containing aerosols in hospital corridors

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Background: Inhalation of airborne SARS-CoV-2 contribute substantially to the spread of covid-19. Several studies have collected SARS-CoV-2 from air in hospital environments, however, most of these sampled close to patients (Dinoi *et al.*, 2022). The corridors of hospitals, where infected patients are not normally present, is an environment where hospital staff usually wear less protective equipment. However, there is still an infection risk, not least from pre- or asymptomatic staff.

Moreover, it is important to understand the size distribution of virus-containing aerosols to predict e.g. aerial spread indoors and deposition pattern in the respiratory tract. Today, detailed information about size distribution of SARS-CoV-2-containing aerosols is lacking.

The aim of this work is to investigate the presence of airborne SARS-CoV-2 in corridors of infection wards, and gain more detailed size information of SARS-CoV-2-containing aerosols. Associations between SARS-CoV-2 presence and relative humidity and/or temperature in the facilities is also explored.

Methods: From March 2020 to April 2021, aerosol particles were collected in hospital corridors at infectious disease wards in Lund and Malmö, Sweden. Two 8-stage cascade impactors (Next Generation Impactor, Copley Scientific, UK) were employed for collection, both operating at flowrates of 60 L min⁻¹ for 12 hours a day, 7 days a week (i.e. 300 m³ of air sampled for each impactor per week). The impactor plates were exchanged every 7 days and a wetted nylon swab (Copan Scientific) was used to swab each impactor stage to collect a sample. The sample was then stored in universal transport media in -80 °C until analysis with real time reverse transcription polymerase chain reaction (RT-qPCR) for detection of SARS-CoV-2 RNA. The size fractions collected were: >8.1 µm, 4.5–8.1 µm, 2.9–4.5 µm, 1.7–2.9 µm, 0.9–1.7 µm, 0.6–0.9 µm, 0.3–0.6 µm, and 0.1–0.3 µm. Indoor temperature, relative humidity and CO₂ concentration was recorded with a CL-11 or CP-11 multiple parameter meter (Rotronic, Germany). Recording was done 24 hours a day, 7 days a week, during the entire sampling period.

Results: At this point, 544 of the 784 collected samples have been analysed by RT-qPCR. 21 of the analysed samples are preliminary positive for SARS-CoV-2, 14 from Lund and 7 from Malmö. Positive air samples were detected in all size fractions except the largest (>8 µm). No clear seasonal pattern was detected among the positive samples.

Temperature measurements showed a mean corridor temperature of 23.4°C (SD: 0.38). Relative humidity varied between 6 and 67 % (mean: 28.4, SD: 10.6). The mean CO₂ level was about 450 ppm.

Conclusions: This dataset comprises the largest dataset so far on aerosols collected in hospital corridors. SARS-CoV-2 was found in the collected aerosols, but the fraction of positive samples was very low. Interestingly, SARS-CoV-2 could be found in the smaller sized particles (< 1 µm). Particles in this size can stay airborne for several hours and deposit in the deep part of the respiratory tract. The measurements of temperature and CO₂ levels indicated a well-controlled indoor environment, which did not seem to affect levels of airborne virus.