Title: Efficacy of ventilation, HEPA air cleaners, universal masking, and physical distancing for reducing exposure to simulated exhaled aerosols in a meeting room-Dataset

Dataset Number: RD-1025-2021-0

Introduction

There is strong evidence associating the indoor environment with transmission of SARS-CoV-2, the virus that causes COVID-19. SARS-CoV-2 can spread by exposure to droplets and very fine aerosol particles from respiratory fluids that are released by infected persons. Layered mitigation strategies, including but not limited to maintaining physical distancing, adequate ventilation, universal masking, avoiding overcrowding, and vaccination, have shown to be effective in reducing the spread of SARS-CoV-2 within the indoor environment. Here, we examine the effect of mitigation strategies on reducing the risk of exposure to simulated respiratory aerosol particles within a classroom-style meeting room. To quantify exposure of uninfected individuals (Recipients), surrogate respiratory aerosol particles were generated by a breathing simulator with a headform (Source) that mimicked breath exhalations. Recipients, represented by three breathing simulators with manikin headforms, were placed in a meeting room and affixed with optical particle counters to measure 0.3–3 μm aerosol particles.

Data Collection Methods

1. Aerosol Particle Generation
    a. 14% w/v KCl aerosolized via single jet Collison atomizer (BGI Sciences)
    b. Exhaled using a simulator with headform with elastomeric bellows (15 L/min minute ventilation)
2. Aerosol Particle Measurement
    a. Exposure metric for each of the three receiver simulators measured by three Grimm 1.108 optical particle counters (0.3–3.0 μm particle range)
    b. Area samples measured by eight TSI 3330 optical particle counters (0.3–10.0 μm particle range)
3. Ventilation Rates
    a. HVAC Supply Rate measured using Alnor Balometer (TSI, Inc.) with a 0.6 m x 1.2 m Capture Hood
    b. Tracer Gas using sulfur hexafluoride and Four Innova Photoacoustic Infrared Spectroscopy Analyzer models 1412, 1412i(2x) and 1512 (California Analytical Instruments, Inc.)
    c. Particle Decay measured using eight TSI 3330 optical particle counters
4. Mask Fit Factors
    a. Three-ply cotton masks (Defender, HanesBrand Inc.) were affixed to all simulators
    b. Measured using PortaCount Pro+ (TSI, Inc.) in N99 mode (all sizes)
5. Ambient Conditions
    a. Relative humidity and temperature probe and data logger (Vaisala, Oyj)
    b. Noise levels were measured using Real Time Octave Band Analyzer (Extech Instruments, Inc.)

Citation

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