Analysis of droplet dispersion and room coverage from a novel automated dry aerosolized hydrogen peroxide system

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Background: A new automated dry aerosolized hydrogen peroxide fogging system is now available that utilizes micron-sized droplet dispersion. This approach uniformly fills the room, offering potential improvements in disinfection of hospital and operating rooms. We aimed to quantify coverage time and efficacy of this novel dry aerosolized hydrogen peroxide fogging system using in-silico modeling techniques.

Methods: We created a mathematical model utilizing COMSOL Multiphysics and the Particle Tracing Module to determine droplet dispersion and coverage in a standardized room geometry (Figure 1) from a dry aerosolized hydrogen peroxide fogging system (Breezy Med, Albuquerque, NM). Room dimensions were set to 11 feet x 12 feet (132 square feet), with an 8 foot ceiling. Stationary turbulent air flow was assumed in the room, with time-dependent droplet sprays in fluid flow including drag forces and gravity but neglecting breakup or evaporation.

Results: Aerosolized hydrogen peroxide particle velocity ranged from 0.2 m/s to over 25 m/s. The stationary velocity streamlines shown in Figure 2 represent the drag force acting on the droplets. At these velocities, room coverage from surface contact with hydrogen peroxide was complete at 1 minute into the treatment course (Figure 3).

Conclusions: A new automated aerosolized hydrogen peroxide system provides complete room coverage in 1 minute in a standardized hospital room model, suggesting rapid and effective disinfection potential.

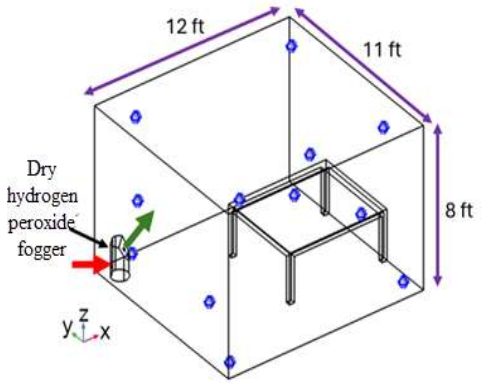

Figure 1. Room geometry of standardized simulation. Room dimensions were set to 11 feet x 12 feet (132 square feet), with an 8-foot ceiling.

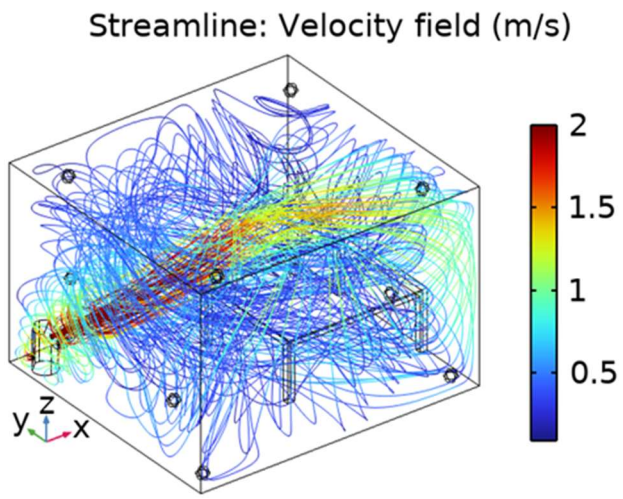

Figure 2. Room stationary velocity streamlines. Room air velocity ranged from 0.2 m/s to over 25 m/s.

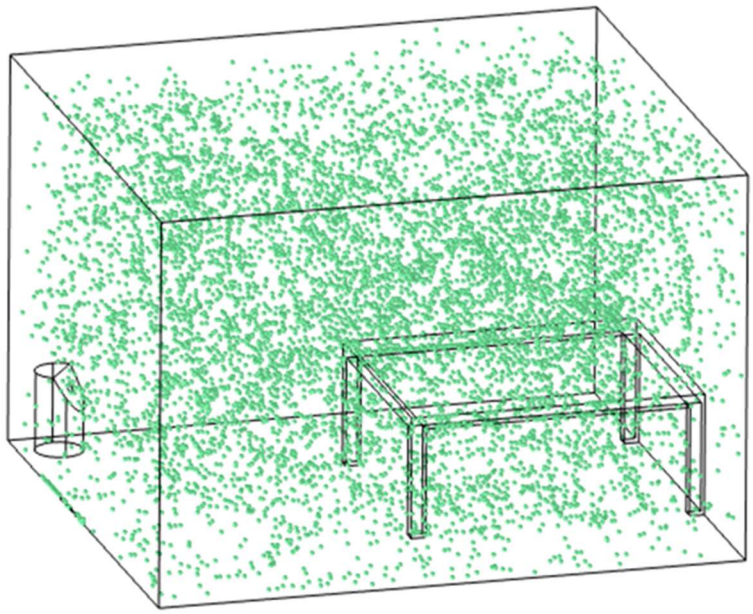

Figure 3. Map of room coverage of aerosolized hydrogen peroxide droplets after one minute of dispersion, showing complete room coverage in 1 minute in a standardized hospital room model.