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DEVELOPMENT OF A PERSONAL SAMPLING SETUP FOR ASSESSING THE EFFICIENCY OF RESPIRATORS AGAINST FUNGAL SPORES

Lee, T. Reponen, W. Li, K. Willeke, S.Grinshpun, University of Cincinnati, Cincinnati, OH.

In this study, we have developed and evaluated a new personal setup for determining the efficiencies of respirators by simultaneously collecting fungal spores and non-biological particles inside and outside N95 filtering facepiece respirators. The setup was optimized by minimizing the particle losses in the aerosol transmission system. The theoretical modeling and laboratory tests were performed for the design optimization. The setup consists of seven components: sampling probe, tubing, sampling chamber, optical particle counter, 25-mm cassette with a polycarbonate filter, flowmeter, and the sampling pump.

The theoretical calculation, which included the aerosol deposition mechanisms such as gravitation, inertia, turbulence, and losses in bending, were modeled for three tubing diameters (1/8", ¼" and ½") and two tubing placements (when it was directed respectively above the ear and the shoulder). The aerosol transmission through the tubing was estimated for the particle size range of 0.7-5 μm, which includes most airborne fungal spores. Since the theoretical values of the transmission efficiency were almost zero for the tubing of 1/8" if the particle size exceeded 3 μm, only tubings of ¼" and ½" were selected for the laboratory experiments. The laboratory study was performed in a walk-in chamber with sodium chloride particles sampling through two sampling lines. One was used to measure the ambient aerosol concentrations and the other to measure the concentrations at the tubing outlet. The ratio of the aerosol concentrations measured with two sampling lines was defined as the transmission efficiency. For the size range of 3-5 μm, the experimental transmission efficiencies were 77% (ear) and 83% (shoulder) for ¼" tubing. The theoretical values were lower, which can be attributed to particle bounce/reentrainment not accounted for by the theory. For ½" tubing, the experimental efficiencies were 77% (ear) and 71% (shoulder). These agreed well with the theoretical data.

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GRADUATE STUDENT POSTER SESSION

ABSTRACTS

Monday, May 12 . . . . 9:00 a.m.–5:00 p.m.
Tuesday, May 13 . . . . 9:00 a.m.–5:00 p.m.
Wednesday, May 14 . 9:00 a.m.–5:00 p.m.
Thursday, May 15. . . .9:00 a.m.–1:00 p.m
(Authors, Present at Their Patrons Wednesday, 10:00 a.m.–Noon)

Graduate Student Poster Session Coordinator:
R. Kent Oestenstad, Ph.D., CIH, University of Alabama at Birmingham, Birmingham, Alabama