Human convection flow in spaces with and without ventilation: personal exposure to floor-released particles and cough-released droplets - DTU Orbit (08/11/2017)

Human convection flow in spaces with and without ventilation: personal exposure to floor-released particles and cough-released droplets

The effects of the human convective boundary layer (CBL), room airflow patterns, and their velocities on personal exposure are examined. Two pollutants are studied which simulate particles released from the feet and generated at distances of 2 and 3 m by a human cough. A thermal manikin whose body shape, size, and surface temperatures correspond to those of an average person is used to simulate the CBL. The findings of the study reveal that for accurate predictions of personal exposure, the CBL needs to be considered, as it can transport the pollution around the human body. The best way to control and reduce personal exposure when the pollution originates at the feet is to employ transverse flow from in front and from the side, relative to the exposed occupant. The flow from the above opposing the CBL create the most unfavorable velocity field that can increase personal exposure by 85%, which demonstrates a nonlinear dependence between the supplied flow rate and personal exposure. In the current ventilation design, it is commonly accepted that an increased amount of air supplied to the rooms reduces the exposure. The results of this study suggest that the understanding of air patterns should be prioritized.

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