

Bulletin de veille émissions d'aérosols par l'appareil respiratoire humain N° 30 – Mai 2026

Objectifs : veille scientifique sur les émissions d'aérosols (gaz et particules) par l'appareil respiratoire humain (nez/bouche).

La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS. Les éléments issus de cette veille sont fournis sans garantie d'exhaustivité.

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Takii A, Ikeda T, Yamakawa M, Chung YM, Kim M.

Modeling and prediction of airborne infection risk in offices: A comprehensive CFD study and machine learning surrogate approach.

Results Eng. 2026;30:13.

<https://www.sciencedirect.com/science/article/pii/S2590123026018116?via%3Dihub>

Airborne transmission of respiratory viruses in office environments remains a critical public health concern. This study aims to quantify how office layout, A/C flow rate, and ventilation influence cough droplet dispersion and infection risk, and to develop a geometry-native surrogate model for rapid risk prediction. Using the supercomputer Fugaku, we conducted 896 simulations combining 32 diverse office layouts with 28 air conditioning and ventilation conditions. A Risk of Infection (RoI) index was defined based on the time-averaged quantity of cough-generated droplets suspended in the inhalation zone. The results revealed that seating arrangements significantly influence exposure risk; wall-facing seats generally exhibited lower and more stable RoI, whereas seats directly under air conditioning outlets showed high volatility depending on airflow settings. To enable rapid risk assessment without computationally expensive CFD, we developed a surrogate model using machine learning. Among ten regression algorithms compared, PointNet, which directly learns from 3D layout geometry, achieved the highest accuracy for the specific configurations investigated in this study. While the superiority of PointNet is demonstrated for this office-based dataset, its broader generalizability remains a target for future multi-facility verification.

Xiao LJ, Chang M, Hu XS, Gao NP, editors.

Propagation characteristics of exhaled flow and its role in indoor airborne transmission-A review.

17th ROOMVENT Conference-ROOMVENT; 2024 Apr 22-25

2025; Stockholm, SWEDEN: E D P Sciences.

https://www.e3s-conferences.org/articles/e3sconf/pdf/2025/72/e3sconf_roomvent2025_01021.pdf

Human talks, coughs, and sneezes are the primary routes for airborne diseases such as COVID19. The understanding of the propagation characteristics of these respiratory events is essential to estimate the infection risk of indoor airborne transmission. Turbulent vortex ring structures have been found in the human exhaled flow by using schlieren imaging technique and Direct Numerical Simulation (DNS). In this context, the traditional circular free air jets formula could not accurately predict the transmission distance of the turbulent flows and carried droplets. This paper systematically reviews the correspondences between jet morphologies and stroke ratios. Based on theories of traditional jets and vortex motion, theoretical analysis is conducted to compare the propagation characteristics of exhaled flow with steady jet, starting interrupted jet, puff and vortex ring morphologies. Calculation results confirm that the vortex ring exhibits lower energy loss, enhanced resistance to disturbances, and longer transmission distances compared to traditional jets, which introduces new characteristics in terms of short-range transmission caused by exhaled flows. Future study could incorporate numerical simulation methods to further investigate the internal structural evolution of exhaled flow to deepen the understanding of the mechanisms of indoor airborne transmission.