# Bulletin de veille émissions d'aérosols par l'appareil respiratoire humain N° 9 – Juin 2024

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



Les bulletins de veille sont disponibles sur le portail documentaire de l'INRS. L'abonnement permet de recevoir une alerte mail lors de la publication d'un nouveau bulletin (bouton « M'abonner » disponible après connexion à son compte).

Kakeshpour T, Fennelly KP, Bax A.

**Snoring-generated fluid droplets as a potential mechanistic link between sleep-disordered breathing and pneumonia.**

Respir Res. 2024;25(1):224.

https://doi.org/10.1186/s12931-024-02856-5

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11137920/pdf/12931_2024_Article_2856.pdf

*The soft palate and back of the throat represent vulnerable early infection sites for SARS-CoV-2, influenza, streptococci, and many other pathogens. We demonstrate that snoring causes aerosolization of pharyngeal fluid that covers these surfaces, which previously has escaped detection because the inspired airstream carries the micron-sized droplets into the lung, inaccessible to traditional aerosol detectors. Measurements were carried out for a single healthy male volunteer. While many of these droplets will settle in the lower respiratory tract, a fraction of the respirable smallest droplets remains airborne and can be detected in exhaled breath. We distinguished these exhaled droplets from those generated by the underlying breathing activity by using a chemical tracer, thereby proving their existence. The direct transfer of pharyngeal fluids and their pathogens into the deep lung by snoring represents a plausible mechanistic link between the previously recognized association between sleep-disordered breathing and pneumonia incidence.*

Oh W, Kikumoto H, Bu Y, Ooka R.

**Evaluation of the spatial distribution of aerosols produced by various respiratory activities.**

J Aerosol Sci. 2024;179:106377.

https://www.sciencedirect.com/science/article/pii/S0021850224000442

*This study investigated the dispersion and evaporation characteristics of droplets and droplet nuclei emitted during human respiratory activities. A specially designed wind tunnel was filled with purified air, wherein selected subjects performed various respiratory activities with their heads positioned inside. An optical particle sizer was used to collect particles with sizes of 0.3–10 µm at 63 points in front of the mouth. The dilution factors were analyzed to investigate the impact of combining the exhaled airflow with ambient air on droplet evaporation. At a distance of 0.01 m from the mouth opening, the volume concentration of the particles was the highest during breathing, followed by coughing and speaking. The volumetric concentration of particles decreased with an increase in the distance from the inlet for all activities. The spatial volume concentration distribution of particles showed that coughing tended to disperse the particles in the forward direction, whereas speaking tended to disperse them laterally. Utilizing these findings in CFD analysis can provide in-depth insights into dispersion and evaporation dynamics. This can contribute significantly to the development of preventive measures through the implementation of proactive HVAC systems to effectively remove infectious particles and control the spread of infectious diseases. Future studies should explore a wider range of particle sizes and advanced sampling techniques for a clear understanding of respiratory particle dynamics and infection control strategies.*

Wu F, Yu C, Xu RZ, Li HK, Yu JC, Zhou SX.

**Risk evaluation of respiratory droplet dispersion in high-speed train compartments with different air circulation systems.**

Atmos Pollut Res. 2024;15(9):12.

https://doi.org/10.1016/j.apr.2024.102197

*Ongoing respiratory epidemics are raising health concerns in public transportation environments, especially in densely populated train compartments. While air circulation systems inside these compartments play a crucial role in controlling the risk of droplets carrying pathogens, the mechanisms and strategies have rarely been investigated. This study employs computational fluid dynamics (CFD) to investigate the impacts on droplet dispersion and exposure risk within passenger compartments under two prevalent air circulation modes: centralized return -centralized exhaust (CR-CE) and distributed return -centralized exhaust (DR -CE), as well as a newly proposed mode, distributed return -distributed exhaust (DR -DE). Additionally, other key influential factors, including the release source location and the respiratory jet speed, are also considered. The results indicate that the CR-CE mode exacerbates the longitudinal airflow in the passenger compartment, thereby increasing the distance of droplet transmission. In contrast, the DR -CE mode moderately restricts the range of droplet spread to a certain extent. When the release source is in the middle of the compartment, the average distance of droplet transmission can be reduced by about 30%. The proposed DR -DE mode further confines the behavior of droplet dispersion, significantly lowering the overall exposure risk for passengers. Furthermore, the results show that sneezing, compared to speaking, results in a decrease in the exposure risk peak among passengers, from approximately 95% to around 70%. The passengers in the four rows directly in front of the release source face a relatively high potential risk. These findings provide valuable insights for improving air quality and passenger safety in public transportation vehicles.*