Bulletin de veille émissions d'aérosols par l'appareil respiratoire humain
N° 19 – Avril 2025

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).

Angerstein W, Fleischer M, Mürbe D.

32 Aerosol Particle Emissions During Voice Production/Playing Wind Instruments.

In: am Zehnhoff-Dinnesen A, Schindler A, Zorowka PG, editors. Phoniatrics III: Acquired Motor Speech and Language Disorders – Dysphagia – Phoniatrics and COVID-19. Cham: Springer Nature Switzerland; 2025. p. 543-63.

https://doi.org/10.1007/978-3-031-48091-1_17

https://link.springer.com/chapter/10.1007/978-3-031-48091-1_17

After explaining aerosol particle emissions by voice production, the experimental set-up under clean-room conditions is introduced and aerosol emission rates for children, adolescents and adults are presented. Their relevance for singing and speaking activities is discussed. Techniques to visualise the flow of aerosols during singing and playing wind instruments are presented in a review from historical set-ups to most modern equipment.

Nikuri P, Maalouf A, Geneid A, Pesonen E, Sanmark E, Vartiainen VA.

Aerosol emission and exposure in non-invasive ventilation.

Sci Rep. 2025;15(1):14058.

https://www.nature.com/articles/s41598-025-98751-0.pdf

From the beginning of the COVID-19 pandemic, there has been concern among clinicians whether the use of high-flow nasal cannula (HFNC) and continuous positive airway pressure (CPAP) contributes to aerosol generation and consequently spreading of pathogens. Most guidelines still classify these treatments as high-risk aerosol-generating procedures. The aim of this study was to evaluate differences in aerosol emissions and exposure with CPAP and HFNC compared to no breathing aid (NBA). Aerosol emissions of 16 healthy volunteers using CPAP, HFNC and NBA were measured with a portable aerosol spectrometer. During each measurement, the volunteers were instructed consecutively to breathe normally, breathe deeply, cough and read aloud a predefined text. The Wilcoxon signed-rank test was used in statistical analysis. Non-invasive ventilation (CPAP, HFNC) does not produce significantly more aerosol than the same respiratory activities without a breathing aid (median CPAP-NBA - 4.54 1/L, p = 0.816, and HFNC-NBA 2.27 1/L, p = 0.244), deep breathing (median CPAP-NBA - 2.27 1/L, p = 0.378 and HFNC-NBA 4.55 1/L, p = 0.623), speaking (median CPAP-NBA 0 1/L, p = 0.0523 and HFNC-NBA 9.09 1/L, p = 0.0140), or coughing (median CPAP-NBA - 17.31 1/L, p = 0.587 and HFNC-NBA 1.92 1/L, p = 0.365). The results indicate that both CPAP and HFNC have no clinically meaningful impact on aerosol emission. Therefore, the use of CPAP or HFNC does not expose healthcare personnel to greater concentrations of aerosols when compared to normal breathing in healthy participants.

Xu CW, Ma WQ, Yi SQ, Liu L, Nielsen PV, Zhang C.

Dynamics of human speech as aerosol transmission sources: Implications for sustainable urban health based on impulsive jet theory.

Sust Cities Soc. 2025;125:15.

https://www.sciencedirect.com/science/article/abs/pii/S2210670725002173?via%3Dihub

In the context of sustainable urban environments and public health, this study investigates exhaled airflows during vocalization to understand their flow dynamics and transmission characteristics. Using illuminated high-speed imaging and PIV, the research characterizes exhaled flows through comprehensive parameters including jet flow stages, injection times, mouth scales, directions, distances, velocities, Reynolds numbers, and dimensionless time parameters, establishing baseline data for flow description and modeling. Through analogy with impulsive jets, two distinct flow regimes were identified based on formation time parameter (t(inj)) and formation number (Fn). Regime A (t(inj)* < Fn) exhibits single vortex ring evolution, while Regime B (t(inj)* > Fn) features additional trailing jets. The formation number (Fn = 5.5-9.0) serves as a critical transition parameter between these regimes, with peak vortex ring vorticity reaching approximately 70 s(-1). Analysis suggests that bulk velocity and injection time may serve as key parameters for simplified CFD modeling, pending validation. As expelled droplets tend to concentrate and penetrate in vortices, disrupting these structures may reduce aerosol penetration and transport. These findings contribute to the theoretical framework for respiratory flow modeling and disease transmission control.*