Bulletin de veille émissions d'aérosols par l'appareil respiratoire humain
N° 15 – Décembre 2024

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

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Ejaz MF, Kilpeläinen S, Lestinen S, Kosonen R.

Experimental comparison of structural and active protective methods against breath- and cough-borne aerosols in a meeting room.

Build Environ. 2024;265:111993.

https://www.sciencedirect.com/science/article/pii/S0360132324008357

https://www.sciencedirect.com/science/article/abs/pii/S0360132324008357?via%3Dihub

In this experimental study, the focus is to address the challenges of cross-contamination due to the presence of an infected individual in a meeting room environment. A detailed analysis is performed to identify effective methods to reduce the spread of infectious aerosols generated due to breathing and coughing. Infectious aerosols are simulated using a Paraffin oil-based solution with a respiratory exhalation simulator integrated with a breathing/coughing machine and an atomizer. Filtration-based active strategies such as the room air purifier, personal air purifier, and facemasks (FFP2 and surgical) along their wearing patterns are examined and compared with structural measures such as face shields and partition walls. The impact of the infectors' location on the exposed person is also studied. Facemasks are the most effective protective measure for both examined respiratory activities and provide over 60 % protection. Other mitigating strategies behaved differently for breathing and coughing trials. In the well-mixed room, during breathing, the portable room air purifier designed for clean air delivery rates (CADR) 2.5 times the ventilation rate effectively reduced aerosol spread. A personal air purifier, with a flow rate of 0.02 times the ventilation rate, offered only partial protection to the exposed occupant. Structural partitions showed marginal effectiveness for breathing but were effective during coughing events. The infector's location has little impact on contaminant levels in a *well-mixed meeting room, except for a slight increase when seated next to the exposed person. This study provides a valuable reference for using different mitigation strategies in indoor settings.*

Francesca C, Gilles B, Alain G, Thierry L, Carine A, Muriel L, et al.

Investigating droplet emission during speech interaction.

Lang Resour Eval. 2024:29.

https://link.springer.com/content/pdf/10.1007/s10579-024-09789-x.pdf

Conversations (normal speech) or professional interactions (e.g. projected speech in the classroom) have been identified as situations which increase individuals' risk of exposure to respiratory viruses (including SARS-CoV-2) due to the high production of potentially infectious droplets. The few studies addressing this topic contain several methodological and linguistic limitations. This paper describes and validates an original combination of various methods, aimed at providing a global understanding of the complex physiological mechanisms underlying droplet emission during speech production. Twenty-one French speakers produced pseudowords and sentences under different phonetic conditions (e.g. loud vs normal intensity). In Experiment 1, we measured the airflow volume and airflow velocity exhaled from the mouth during speech. In Experiment 2, we measured the airflow velocity exhaled from different positions in the space around the mouth. In Experiment 3, we measured the number and size of expelled droplets. In all experiments, participants were asked to produce pseudowords and sentences under different phonetic conditions in an interactive setting. To validate our methodology, we tested the impact of voice intensity on the physiological measurements. We found that pseudowords and sentences spoken with loud intensity generated increased airflow volume and velocity compared to those spoken with normal intensity. Additionally, the number of droplets was higher for pseudowords spoken with loud intensity compared to normal intensity. From a methodological point of view, our study went beyond previous research by using multiple measures characterising droplet emission during speech. Furthermore, we applied an innovative experimental design, considering droplet emission in an interactive linguistic setting.