

Aerosols, a tool for assessing airborne transmissions of hazardous substances and agents

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How do you assess the risk of aerosols carrying hazardous substances and biological agents? How can companies protect products and their workers? Understanding airflow and ventilation is central to understanding airborne transmission and therefore to successful risk management. Aerosols can be a useful tool for this assessment.

The movement of aerosols sized a few micrometers is determined by the air around them. These aerosols are too large to diffuse and too small to sediment rapidly. In well-mixed rooms, their concentration is highest near the source and decreases with distance. But many rooms are not perfectly mixed. Instead, the airflow is often directional, frequently chaotic. This flow together with eddies defines where the emitted aerosols go, how long they stay airborne and how well they mix in the air.

A practical approach to assessing airflow and ventilation in real environments is to use pulses of theatrical fog or salt crystals released at locations with an assumed source. Theatrical fog allows direct visualization of the movement of the aerosol cloud. A network of sensors can help determine the time from release to impact at other locations in the room. Dose quantification is also possible using peak area, emission duration and rate of the passing cloud together with fog evaporation parameters. However, the stability of theatrical fog is not always sufficiently predictable. In such situations, more stable aerosols such as salt crystals can be used instead. This approach can be used to assess airflow, ventilation and aerosol transmission in real-world situations such as operating theatres, factories, schools, offices and concert halls. The visual effects of theatrical fog are also very useful in persuading workers and decision-makers alike to take the necessary protective measures.