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Yeh, K. B., Anderson, B. D., Jarvis, E. B., Kong, M., Olinger, G. G., Parekh, F. K., *et al.*

[Catch Me if You Can: Reducing Infectious Disease Through Better Indoor Air Quality and Biosurveillance.](#)

Health Security, (2026)

Infectious disease transmission continues to be an unmet challenge. This is in part due to the air that circulates within our indoor environments, which can contain a myriad of potentially pathogenic bacteria, fungi, mold, and viruses as well as various allergens. This issue was highlighted during the COVID-19 pandemic, due to the highly infectious nature of SARS-CoV-2 and the public measures taken to limit airborne transmission of the pathogen through quarantining, social distancing, and maskwearing. The broad disruption in normal activities and interactions within these indoor environments prompted rethinking how indoor air quality can be improved to further mitigate infectious disease transmission. There is opportunity to accomplish health security and biosurveillance for protecting critical building infrastructures by incorporating existing and new measures for detection and control of microbial burden. Integrating central building controls and systems for heating, ventilation, and air conditioning with ongoing detection of environmental flora and microbes can help identify emerging pathogens and endemic biothreats such as SARS-CoV-2 and Legionella, respectively. This effort, however, will require (1) synergistic funding from 1 or more government agencies and multiple commercial entities to maintain habitable indoor environments and (2) environmental factors on infectious disease emergence and transmission to improve health outcomes and overall national security. In this commentary, we illustrate the importance of indoor air quality through case studies of infectious pathogens, their interaction with indoor environments, and measures to curtail the airborne transmission of respiratory disease.

Seidelman, J., Ku, T. S. N., Lafontaine, A., Donskey, C. J., Mcgee, E., Pryor, R.

[Challenging cases in infection prevention and control: proceedings from SHEA Spring 2025.](#)

Antimicrobial Stewardship & Healthcare Epidemiology, Vol. 6 n°(1), (2026), e42 p.

Hospital epidemiologists and infection prevention professionals are frequently required to make high-stakes decisions in complex clinical scenarios where evidence-based guidance is limited or absent. These decisions often carry significant implications for patient safety, healthcare worker protection, hospital operations, and legal or financial risk. This article presents three challenging cases originally featured during the “Interesting Cases” session at the Society for Healthcare Epidemiology of America (SHEA) Spring 2025 Conference, with the goal of sharing practical lessons learned and contributing to the evolving literature in healthcare epidemiology. The first case describes the intraoperative contamination of a polyethylene liner during emergency revision total hip arthroplasty, highlighting limited data guiding implant salvage and the role of antiseptic decontamination, interdisciplinary communication, and institutional preparedness. The second case examines infection prevention risks associated with a temporary hospital heating, ventilation, and air conditioning (HVAC) shutdown during a COVID-19 surge, emphasizing the use of real-time ventilation assessment tools such as carbon dioxide monitoring to guide mitigation strategies. The third case details the application of failure mode and effect analysis (FMEA) to develop an infection prevention and control policy for the educational use of non-transplant cadaveric tissue in patient care areas—an area with no existing guidelines. Collectively, these cases illustrate the realities of decision-making under uncertainty in hospital epidemiology and demonstrate how structured risk assessment, proactive planning, and cross-disciplinary collaboration can mitigate potential harm. Sharing these

experiences provides practical insights and reinforces that, even in the absence of definitive guidance, systematic approaches can support safe infection prevention decision-making.

Cattai, F.

[Control of airborne biocontamination in HVAC systems through UV-C irradiation. An experimental and numerical study of the UV-C field.](#)

Università degli Studi di Roma" La Sapienza". Thèse 2026

In a broader context, this research contributes to the scientific effort to harmonize testing and measurement procedures for UV-C disinfection. The experimental–numerical methodology proposed here can serve as a reference for future standards, enabling reproducible, traceable, and verifiable evaluations of UV-C systems in real-world conditions. In conclusion, the doctoral research presented in this thesis establishes an integrated framework combining experimental characterization and optical modeling for the analysis and optimization of UV-C LED systems applied to air disinfection. The results provide engineers and researchers with validated tools for designing efficient, safe, and environmentally sustainable solutions. Future developments will focus on coupling optical and thermal modeling, evaluating long-term LED stability, and integrating real-time control systems that adapt UV-C intensity to air quality variations. Ultimately, this work aims to contribute to the creation of healthier, safer indoor environments through the responsible, innovative use of UV-C technology.

Asemota, A., Kelly, U.

[Determining Factors of Microbial Air Quality of Pleurotus Ostreatus Cultivation Facility.](#)

International Journal of Research and Innovation in Applied Science, Vol. X n°(XII), (2026), 576-593 p.

Microbial air quality is a critical determinant of environmental hygiene and production efficiency in Pleurotus ostreatus cultivation facilities, yet it remains insufficiently addressed in many commercial systems. Airborne microorganisms, including bacterial cells and fungal spores, originate from multiple sources such as growth substrates, mushroom biomass, irrigation practices, human activity, ventilation systems, and the surrounding outdoor environment. Once aerosolized, these bioaerosols are transported, deposited, or removed through dynamic indoor air processes influenced by environmental and operational conditions.

Kuchkorova Munavvar Fakhridin, Q.

[Epidemiological Characteristics OF Airborne Droplet Infections.](#)

World Bulletin of Public Health, Vol. 51, (2025), 85-89 p.

Airborne droplet infections represent a significant mode of transmission for many respiratory pathogens. These infections occur when respiratory secretions—such as from coughing, sneezing, talking or singing—produce droplets and droplet nuclei that contain infectious agents. The size, evaporation and transport dynamics of these particles are critical in determining their infectious potential. Smaller droplets may evaporate rapidly, forming droplet nuclei that remain suspended in air for extended periods and travel beyond short-range distances, while larger droplets settle quickly. Factors such as indoor airflows, humidity, ventilation, crowding and susceptibility of hosts influence epidemiological characteristics. Key features include rapid person-to-person spread in closed environments, variable incubation periods, and the possibility of asymptomatic or pre-symptomatic transmission. Understanding these dynamics is crucial for preventive measures including masks, ventilation improvements, distancing and hygiene. This review outlines the epidemiological features of airborne droplet infections, describing pathogen sources, modes of transmission, environmental and host factors impacting spread, and implications for control and prevention.

Salehi, M., Jahangir, M. H., Rashvand, N.

[Excess energy consumption assessment of natural ventilation due to COVID-19 expansion in a bank building.](#)

Results in Engineering, Vol. **29**, (2026)

The COVID-19 pandemic has significantly reshaped the design priorities of indoor environments, emphasizing the need for effective strategies to mitigate airborne transmission while maintaining energy efficiency. This study investigates optimizing of ventilation strategies in a bank building, focusing on the combined use of mechanical systems, natural ventilation, and electrochromic glazing. Various scenarios were simulated under extreme climatic conditions to assess their impact on HVAC energy consumption and infection risk. Ventilation flow rates ranging from 0.25 to 0.45 m³/s were evaluated by ASHRAE and WHO guidelines. The analysis revealed that increased ventilation significantly lowers infection probability, especially at lower occupant densities, but leads to higher energy consumption beyond a certain threshold. Natural ventilation proved effective in reducing both energy use and infection risk, particularly during the hottest week. Moreover, the implementation of electrochromic glass resulted in a 16.7% reduction in cooling energy demand and a substantial decrease in infection risk from 4.5% to 1.51%. The novelty of this research lies in its integrated multi-objective optimization framework using the NSGA-II algorithm, which simultaneously considers infection risk, energy use, and occupant density. Additionally, the study employs a co-simulation approach combining EnergyPlus and MATLAB, and uniquely evaluates the role of electrochromic glazing in enhancing pandemic resilience. The outcomes offer practical insights for designing energy-efficient, health-conscious indoor environments during and beyond pandemic conditions.

Duchaine, C., Longtin, Y., Veillette, M., Larotta, A., Paquet Bolduc, B.

[Exposition professionnelle aux agents d'infections nosocomiales en milieux de soins: mieux comprendre et contrôler la voie de propagation par aérosols.](#)

IRSST. Québec 2026

Ce projet, mené dans le contexte de la pandémie de COVID-19, visait à mieux comprendre les risques liés à la présence de virus et de bactéries dans l'air des milieux de soins et à identifier les meilleures façons de protéger le personnel de la santé. Ce projet s'est articulé autour de trois grands volets de recherche complémentaires, menés en milieux réels et en laboratoire.

Chen, X., Lin, C., Xia, W., Dong, S., Luo, A., Cui, Z., *et al.*

[Interactive study on thermal comfort and air quality with PM2.5 pollution and respiratory disease risk of high-speed railway stations in cold regions.](#)

Case Studies in Thermal Engineering, Vol. **79**, (2026)

High-speed railway station (HRS) is urban rail transit hub whose thermal environment and air quality directly affect passengers' thermal comfort experience and respiratory disease risk. However, there is a lack of comparative studies on thermal comfort and air quality in both above-ground space (AS) and underground space (US) of HRS, and the thermal comfort differences between local residents and non-local tourists are overlooked. Therefore, this study investigates and analyzes the thermal comfort and pollutant in AS and US of Zhangjiakou HRS (a cold region) in summer showing that: (1) In AS, local residents' neutral standard effective temperature (NSETrs) was 24.7 °C, higher than the tourists' NSET (NSETts) of 22.9 °C; in US, NSETrs was 26.9 °C while NSETts was 28.9 °C. In both AS and US, the NSETrs is closer to the objective environment than NSETts, with a wider neutral standard effective temperature range (NSETR), indicating that under the conditions of this study local residents have stronger adaptability to the local thermal environment than tourists. (2) The diffusion of PM2.5 and PM10 in US is

limited and prone to accumulation, with an higher average concentration than that in AS, PM2.5 not exceeding 25 µg/m³ and PM10 not exceeding 48 µg/m³ (3) Tourists are more sensitive to the perception that “increased pollutant concentrations reduce thermal sensation”; “pollutant concentrations tend to increase under conditions of low temperature, low air velocity, and high humidity”. This paper can provide experimental data to support the improvement of thermal comfort and the reduction of respiratory disease risk caused by PM2.5 pollution.

Ritacco, M.

[Masked and Modified Mycotoxins in Indoor Environments.](#)

RespirareLabs, (2026)

Mycotoxins are chemical compounds, not living organisms. Accordingly, claims such as “destroy,” “neutralize,” “denature,” or “render inert” require chemical and exposure aligned substantiation rather than organism control logic. Substantiation should demonstrate reduction of the parent (unmodified) mycotoxin to below the stated method reporting limit within the claim-relevant domain, with reporting basis specified (LOD or LOQ). When transformation is claimed, resulting products require identification and evaluation of toxicological relevance for the specified exposure route. (EFSA CONTAM Panel, 2014). “Rendered inert” is not an analytical finding by itself. It must be tied to specified toxicological endpoints relevant to the claimed exposure route, supported by identification of transformation products and evidence they do not retain toxicologically relevant activity at plausible exposure conditions. Exposure aligned verification characterizes inhalation relevant conditions during a defined sampling interval and does not, by itself, represent cumulative exposure over longer timeframes. Mycotoxins are chemically stable small molecules that can persist under many conditions, which is one reason why unqualified “destruction” claims warrant disciplined substantiation (World Health Organization [WHO], 2023).

Ávila Bocanegra, C. P., Rodríguez Soto, J. C.

[Nivel de contaminación del aire por presencia de microorganismos dentro de un mercado de Trujillo.](#)

REBIOL, Vol. 45 n°(2), (2026), 44 - 49 p.

Public markets are high-traffic environments where environmental conditions and food handling practices may promote airborne microbial dispersion. This study aimed to determine the level of air contamination by the presence of microorganisms inside a market in Trujillo. A representative sampling design was conducted in 10 commercial areas using the passive sedimentation method, employing blood agar for bacteria and Sabouraud agar for fungi, twice weekly for 10 weeks. Isolated microorganisms were phenotypically identified and classified according to contamination levels. Fruit, vegetable, tuber, meat, and fish areas showed intermediate bacterial contamination, whereas clothing, footwear, and sanitary areas exhibited low or very low levels. Fungal contamination was predominantly low, except in the tuber area. The findings reveal spatial variability and highlight the importance of continuous microbiological monitoring to support preventive sanitary management.

Ritacco, M.

[Operationalizing the Exposure Aligned Analytical Domain Framework for Indoor Mycotoxins: Inhalation Aligned Airborne Assessment in Indoor Environments.](#)

RespirareLabs, (2026)

Indoor environmental testing frequently produces analytically valid results that become clinically or operationally misleading when the measurement domain is substituted for the exposure pathway of

interest. In indoor mycotoxin investigations, interpretive drift most commonly occurs when dust-based findings are used to answer inhalation questions or when biological indicators are treated as chemical evidence.

The Exposure-Aligned Analytical Domain Framework for Indoor Mycotoxins (EADF-IM) was developed to prevent such substitution errors. Ritacco (2026a) formalized the physicochemical divergence of biological and chemical indicators across airborne, dust reservoir, and surface phases. Ritacco (2026b) articulated hazard-construct precedence and analytical domain non-equivalence as governing interpretive principles within EADF-IM.

This manuscript operationalizes those principles for indoor air-mediated exposure assessment. When the decision concerns indoor air-associated exposure, inhalation is the pathway of interest and breathing-zone, inhalable-fraction air sampling constitutes the domain-aligned evidentiary basis for exposure characterization (American Conference of Governmental Industrial Hygienists [ACGIH], 2022; European Committee for Standardization [CEN], 1993, 2018; International Organization for Standardization [ISO], 1995). The mechanistic rationale, field implementation requirements, and interpretive limits necessary to preserve domain integrity are defined for clinicians and indoor environmental professionals engaged in indoor mycotoxin assessment.

Bowe, A., Jaramillo, P., Dsa, O. C., Southey, A.

[Synergistic Effects of Low-Level UV and Hydrogen Peroxide in Reducing Airborne Influenza A \(H1N1\).](#)

6th International Congress on Health Innovation—INOVATEC 2025

This study evaluated the effectiveness of a novel air decontamination technique based on the synergistic use of low-level ultraviolet (UV) light and hydrogen peroxide (H₂O₂). Separately, these components show limited antiviral efficacy, but when combined, they generate reactive oxygen species that are approximately ten times more powerful than traditional disinfection methods. The process accelerates the decomposition of harmful viral particles, leaving behind only water and oxygen. Methodology: Experiments were conducted in a 28.5 m³ environmental chamber under controlled temperature and humidity. Six decay tests were performed: three control runs and three active runs with the UV-H₂O₂ system operating. Airborne Influenza A (H1N1) was aerosolised and sampled at multiple time points. Viral RNA concentrations were quantified using real-time qPCR. Results: Control runs showed stable airborne virus concentrations with a natural decay of only 22.9%. In contrast, the UV-H₂O₂ technique achieved rapid and consistent viral reduction, reaching 95.4% within 50–60 min in two test runs, and 95.6% in a third run with reduced UV exposure. Importantly, no harmful ozone generation was detected. Conclusion: The combined low-level UV and H₂O₂ technique provides a highly effective, safe, and sustainable approach for reducing airborne viral loads, demonstrating its strong potential to enhance indoor air quality and mitigate infectious disease transmission.

Wellham, H. F., Gillani, S., Ameaka, F. N., Campbell, E. A., Toner, E. S., Ravi, S., *et al.*

[A systematic review to guide measles exposure periods for contact tracing.](#)

eBioMedicine, Vol. 124, (2026)

Summary Background This systematic review examined the duration of measles virus airborne transmissibility after a source case is no longer present to identify evidence gaps in measles contact tracing exposure window guidelines. Methods A systematic literature review following PRISMA guidelines was conducted using PubMed, EMBASE, Web of Science, and SCOPUS databases for publications from January 1988 to July 2024. Additional sources were identified through reference list reviews and Google Scholar searches. Studies examining how long the measles virus survives in the air or remains transmissible after an infectious case leaves a public space were included, while editorials, opinion pieces,

non-evidence-based recommendations, mathematical models, and publications unrelated to airborne transmission of measles in public environments or not available in English were excluded. Researchers extracted summary data. Findings Initial database searches identified 1054 studies, with none meeting initial inclusion criteria after screening. Supplemental searches identified five relevant articles (1964–1987). Two experimental studies and three real-world studies demonstrated measles virus survival between 29 and 120 min, with increasing survival time for lower humidity levels. Interpretation Current guidelines for measles contact tracing exposure windows rely on limited research from 1964 to 1987. Additional studies are urgently needed to understand how long the virus is transmissible in real-world settings, particularly given the implications for contact tracing efficiency and resource allocation during outbreak responses. Funding U.S. Centers for Disease Control & Prevention (Cooperative Agreement #NU38FT000004).
