The microbial ecology of built environments: Unraveling the invisible microbiome of indoor spaces.

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Introduction

In our daily lives, we spend the majority of our time indoors, whether at home, in the office, or in other built environments. While we may think of these spaces as sterile and devoid of life, they are, in fact, teeming with microbial life. From the air we breathe to the surfaces we touch, indoor environments harbor a diverse array of microorganisms that play crucial roles in shaping the indoor microbiome, influencing human health, and shaping the built environment itself. Understanding the microbial ecology of built environments is essential for promoting indoor air quality, preventing the spread of infectious diseases, and creating healthy indoor environments for occupants [1].

The indoor microbiome is a complex ecosystem composed of bacteria, fungi, viruses, and other microorganisms that inhabit indoor spaces. These microorganisms colonize various surfaces and substrates, including floors, walls, furniture, and HVAC systems, forming diverse microbial communities that are influenced by factors such as occupancy patterns, building design, ventilation systems, and environmental conditions. Despite their invisibility to the naked eye, indoor microbes play crucial roles in indoor air quality, building materials degradation, odor production, and human health [2,3].

Recent advances in high-throughput sequencing technologies and metagenomic analysis have revolutionized our understanding of the indoor microbiome, shedding light on the composition, diversity, and dynamics of microbial communities in built environments. Studies have revealed that indoor microbial communities are highly dynamic and can vary significantly over time and across different indoor environments. Factors such as occupancy, ventilation, humidity, temperature, and building materials can all influence the composition and activity of indoor microbial communities, shaping the indoor microbiome in complex and often unpredictable ways [4].

One of the key challenges in studying the indoor microbiome is identifying and characterizing the sources of indoor microbial diversity. Indoor environments are influenced by a wide range of microbial sources, including human occupants, pets, outdoor air, building materials, and HVAC systems. Human-associated microbes, in particular, play a significant role in shaping the indoor microbiome, with occupants serving as both sources and sinks of microbial diversity. Studies have shown that human occupancy can significantly impact the composition and diversity of indoor microbial communities, with factors such as occupancy density, activity level, and personal hygiene habits influencing the microbial load and diversity in indoor environments [5,6].

Moreover, indoor microbial communities can have important implications for human health and well-being. While many indoor microbes are harmless or even beneficial, others have been implicated in indoor air quality issues, allergic reactions, asthma exacerbations, and infectious diseases. Indoor environments provide ideal conditions for microbial growth and proliferation, with factors such as high humidity, poor ventilation, and organic matter providing substrates for microbial colonization and growth. Inadequate indoor air quality can lead to the accumulation of airborne pollutants, allergens, and pathogens, posing risks to human health and comfort [6,7].

The COVID-19 pandemic has underscored the importance of understanding the role of indoor environments in the transmission of infectious diseases. SARS-CoV-2, the virus responsible for COVID-19, can be transmitted through respiratory droplets and aerosols, which can linger in indoor air and on surfaces for extended periods. Indoor environments with poor ventilation and crowded conditions can facilitate the spread of the virus, leading to outbreaks in settings such as healthcare facilities, schools, and workplaces. Strategies for mitigating the spread of infectious diseases in indoor environments include improving ventilation, implementing air filtration and purification systems, and promoting personal hygiene practices such as handwashing and mask-wearing [8].

Furthermore, the microbial ecology of built environments has implications for building design, construction, and maintenance. Understanding the interactions between indoor microbial communities and building materials can inform strategies for preventing microbial growth, mold infestations, and deterioration of indoor surfaces. Building materials with antimicrobial properties, such as copper, silver, and antimicrobial coatings, can help inhibit the growth of harmful microbes and maintain indoor air quality. Moreover, green building practices, such as using sustainable materials, incorporating natural ventilation, and promoting daylighting, can create healthier indoor environments that support human health and well-being [9,10]

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Conclusion

The microbial ecology of built environments is a complex and dynamic field that has important implications for indoor air quality, human health, and building design. By unraveling the invisible microbiome of indoor spaces, researchers can gain insights into the factors that shape indoor microbial communities, the sources of indoor microbial diversity, and the role of indoor microbes in human health and well-being. Understanding the interactions between indoor microbial communities and the built environment can inform strategies for promoting healthy indoor environments, preventing the spread of infectious diseases, and creating sustainable buildings that support the health and well-being of occupants.

References

1. AL-Hasnawi SM. Incidence of chickenpox and mumps in Karbala Governorate with their seasonal variation. Iraq Med Journ. 2018;2(1):24-7.
2. Hambleton S. Chickenpox. Current opinion in infectious diseases. 2005;18(3):235-40.
3. Atshan RS. Incidence of chickenpox and mumps in Karbala Governorate with their seasonal variation. Iraq Med Journ.2018;2(1):24-7.
4. Saiman L, Persistence of immunity to varicella-zoster virus after vaccination of healthcare workers. Infection Control & Hospital Epidemiology. 2001;22(5):279-83.
5. Leeuwen, Anne. Davis's comprehensive handbook of laboratory & diagnostic tests with nursing implications.
6. Johannsen EC, KM K. Epstein-Barr virus infectious mononucleosis epstein-Barr virus-associated malignant diseases, and other diseases. Prin pract infec dis. 2015;7(4)255-8.
7. Robertson. Epstein-Barr Virus.2009;206(10)10-15.
8. Luzuriaga, K; Sullivan, JL. Infectious mononucleosis. N Eng Journ Med.2017;23(2):1-7.
9. Ebell MH. Epstein-Barr virus infectious mononucleosis. Amer Fam Phy.70 (7): 1279–87.
10. Shorvon, Simon D. The Causes of Epilepsy: Common and Uncommon Causes in Adults and Children .2020;19:587(45):13-9.

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