

Jeff Charlton Reports Underestimated Pollen Exposure at Singapore IAQ Conference

Building Forensics research found 100,000+ biofluorescent fragments, suggesting conventional pollen-grain counts may understate potential exposure.

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Our findings suggest that counting intact pollen grains alone may overlook numerous smaller biological fragments capable of carrying allergens and potentially bacteria deeper into the lungs.”

Jeff Charlton, Lead Author

KINGDOM — [Building Forensics](#) Ltd has announced international research presented in Singapore examining whether pollen should be understood not only as an allergen, but also as a potential carrier of bacteria and bacterial endotoxin during high-humidity and thunderstorm events.

The work followed an unusual environmental observation in which biofluorescence measurement detected more than 100,000 fluorescent biological fragments rather than simply counting intact pollen grains. The magnitude of the finding raised questions that conventional pollen-counting methods alone could not answer.

The observation did not by itself identify a pollen species, confirm bacteria or establish whether every fragment was newly released. Some material could represent older pollen-derived residue retained in an indoor environment. The research question is whether fragments can preserve biologically relevant pollen allergens or associated bacterial material after the intact grain is no longer visible or countable.

Intact pollen grains are generally too large to penetrate deeply into the lungs. Under high humidity, rainfall and osmotic stress, however, pollen can hydrate and rupture, releasing far smaller fragments. Peer-reviewed research shows that respirable pollen particles can reach lower-airway regions that intact grains would not normally enter.

The investigation led to the paper ‘Pollen-Borne Endotoxin: A Mechanistic Framework for Composite Bioaerosol Exposure and Thunderstorm Asthma.’ Jeff Charlton of Building Forensics Ltd is lead author. Vincent ‘Vince’ Neil of Mycotox Pty Ltd and David Larke of NSJ EnviroSciences Pty Ltd are co-authors.

The paper examines evidence that pollen surfaces support communities of bacteria, including Gram-negative species capable of producing lipopolysaccharide, commonly called bacterial endotoxin. It proposes that when pollen ruptures, some smaller particles may carry allergenic proteins together with bacteria or bacteria-derived inflammatory material.

This composite-bioaerosol framework could help researchers investigate why some high-pollen

and thunderstorm events produce respiratory effects that appear disproportionate to conventional intact-pollen measurements. It also raises practical questions about whether monitoring and filtration systems designed around intact grains fully represent smaller biological particles.

‘Finding very large numbers of biofluorescent fragments changes the question,’ said lead author Jeff Charlton, Principal Consultant at Building Forensics Ltd. ‘It is no longer sufficient to ask only how many intact pollen grains were present. We also need to ask what the fragments may represent, what the pollen carried, whether it ruptured, whether residues persisted and where smaller particles could deposit in the respiratory system.’

Charlton added: ‘The research does not claim that every pollen fragment carries harmful bacteria or that this mechanism alone explains thunderstorm asthma. It presents a testable framework for examining combined allergen and bacterial-endotoxin exposure rather than treating each component in isolation.’

Published research supports the separate elements of the framework. Studies have identified bacteria and endotoxin associated with highly allergenic pollen. Thunderstorm-asthma research also recognises that humidity and storm outflows can rupture pollen and concentrate respirable allergenic particles near ground level. Direct confirmation that the same environmental fragment co-delivers allergen and biologically active endotoxin at a clinically relevant dose remains an important research question.

The authors recommend size-fractionated air sampling, conventional pollen measurements, bacterial identification and endotoxin analysis during high-pollen, high-humidity and thunderstorm periods. Smaller fragments can also enter buildings through open windows, air leakage and ventilation systems, making the framework relevant to indoor-air-quality assessment and health-sensitive environments.

The paper is presented as a developing mechanistic framework requiring targeted experimental validation, not as a settled explanation or medical diagnostic method.

About Building Forensics Ltd

Building Forensics Ltd provides specialist investigation of damp, mould, water damage, biological contamination, indoor environmental conditions and potential exposure pathways. Its work combines building investigation, environmental measurement, laboratory evidence and more than three decades of practical experience. Building Forensics does not provide medical diagnosis, and environmental findings should be considered alongside appropriate clinical assessment.

Research sources

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