

Exposure to fungus leads to cell damage in the airways, increases allergy symptoms

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A new study finds that exposure to a widespread outdoor fungus can increase cell damage (oxidative stress) in the airways. This spike weakens the airways' barrier defense system that, when functioning normally, removes infection- and allergy-causing organisms (mucociliary clearance). The study, published ahead of print in the *American Journal of Physiology—Cell Physiology*, was chosen as an APSselect article for June.

Alternaria alternata is a fungus that produces spores in the dry, warm weather of late summer and early fall. Previous studies have found that *Alternaria* produces up to three times more spores when [atmospheric carbon dioxide](#) (CO₂) levels are high. Airway exposure to the fungal spores may induce [allergy symptoms](#) and asthma in some people.

A research team from the University of Minnesota and the Mayo Clinic took [cells](#) from the lining (epithelium) of human airways and exposed them to *Alternaria*. The researchers analyzed the exposed cells to determine the effects of fungal exposure on permeability properties and barrier function of the epithelium. When permeability is compromised, proteins and nutrients can leak out of the lining and into the airways. In addition, reduced barrier function can let bacteria and other allergens enter the airways, increasing the risk of inflammation and infection.

The research team also measured [oxidative stress](#), or cell damage, in the treated cells. Exposure to *Alternaria* produced more cell damage in the cells of the [airway](#)'s lining. Fungus-treated cells had higher

concentrations of calcium, which prompted the epithelial cells to secrete more salt and fluid than usual. Salt and fluid secretion is normally associated with improved mucociliary clearance—keeping the airways free of allergens. "However, prolonged exposure [to *Alternaria*] leads to disruption of epithelial barrier function that would ultimately reduce mucociliary clearance," the researchers wrote. Reduced mucociliary clearance typically makes allergy symptoms worse.

Current climate-warming trends may intensify the problem, the research team noted. "These results suggest that continuing increases in atmospheric CO₂ associated with global climate change will increase both the level of *Alternaria* [exposure](#) and antigenicity [the ability to produce an immune response] of spores that come in contact with the airways."

More information: Nathan A. Zaidman et al. Airway epithelial anion secretion and barrier function following exposure to fungal aeroallergens: Role of oxidative stress., *American Journal of Physiology - Cell Physiology* (2017). [DOI: 10.1152/ajpcell.00043.2017](https://doi.org/10.1152/ajpcell.00043.2017)

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