Climate Change Could Make Allergy Season More Miserable for Millions, Researchers Find

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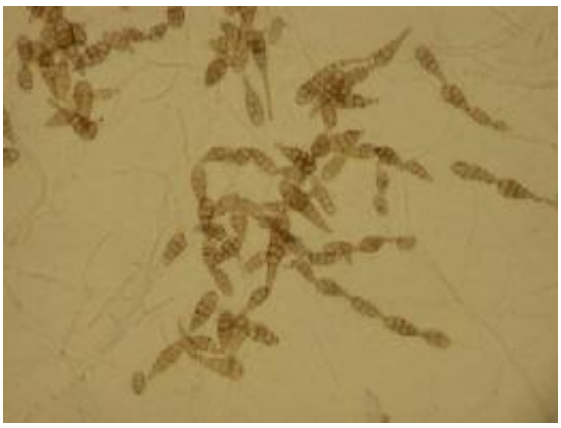

(PhysOrg.com) -- A new study of the relationship between carbon dioxide levels and plant growth suggests for the first time that not only do plants grow bigger and produce more pollen when exposed to higher levels of the greenhouse gas, CO2, but the common, allergen-producing fungus Alternaria alternate produces three times more spores (right) when feeding on those enriched plants. The spores disperse on the wind, making allergies and asthma symptoms worse.

Although such well-fed spores may contain less protein per spore, if models of climate disruption and global temperature rise are correct, the

overall increase in airway-irritating antigen to which people will be exposed in 2040 will be roughly two times higher than now, according to Christine Rogers, an aerobiologist at the University of Massachusetts Amherst School of Public Health and Health Sciences.

As she explains, “The fungi have an enriched food source and produced three times as many spores, but less protein per spore. Overall, the amount of antigen people are going to be exposed to is roughly twice as high. This is the first time we know of that a study has looked at the level of antigen in fungal spores in response to carbon dioxide.”

The research group, including another UMass Amherst researcher, Michael Muilenberg, plus colleagues at the University of Maryland and the USDA Agricultural Research Service, Beltsville, Md., reported these results in the online current edition of the journal Environmental Health Perspectives.

It has been known for some time that increasing levels of CO2 can increase the ability of some plants to grow larger and produce more pollen, making life miserable for people who are allergic to the tiny irritants. The increase in available carbon lets plants produce more carbohydrates and proteins, which serve as additional nutrients for fungi that feed on the plants. Spores from Alternaria, a fungus that lives on plants and in soil, similarly triggers asthma and allergic symptoms. Nearly 12 percent of asthma sufferers are sensitive to this fungus, and in some places the percentage is higher.

For the study, Rogers and colleagues studied how four different CO2 levels in the air, 300, 400, 500 and 600 parts per million (ppm), controlled in environment chambers, affected biomass production and leaf carbon content of timothy grass, a common hay crop.

The four CO2 levels are intended to simulate four global averages over

time: 19th century (300 ppm), current levels (400 ppm), and two higher levels we're predicted to reach by approximately 2025 (500 ppm) and 2040 (600 ppm), by the Intergovernmental Panel on Climate Change. However, some urban areas already average 500 ppm of this greenhouse gas in the air because of high traffic and other emissions, Rogers points out.

The researchers then inoculated the grass with Alternaria spores and measured the fungal spore production. They found that plants grown at higher CO2 levels predicted to be reached around 2025 and 2040, showed increased carbon:nitrogen (C:N) ratios. Plants grown at the highest level also produced more biomass. Finally, Alternaria grown on these carbon-rich leaves produced nearly three times more spores.

In further analyses conducted in Rogers' laboratory at UMass Amherst, she and Muilenberg determined the concentration of antigenic protein, the key component in allergic reactions, in the spores of the fungus growing on the carbon-rich plants.

The researchers suggest that more work is needed to understand how changes in the more highly exposed grass led to increased spore production in the fungus, "but the current study suggests that for allergy and asthma sufferers, exposure to fungal spores may be an increasing problem as atmospheric CO2 levels rise," they conclude.

Provided by University of Massachusetts Amherst