FORECASTING AIRBORNE MOLD

Exposure to mold spore aeroallergens can trigger numerous allergic reactions ranging from mild to severe. Persons vulnerable to mold spore exposure can benefit from timely warnings of increased spore levels, and health care professionals can use this information to develop strategies to prevent some adverse outcomes. Currently, estimates of mold spore levels are based on data acquired from a limited number of ground-monitoring stations that are unavailable in many parts of the country. This method of data collection and processing is also quite expensive.

Previous studies show that many meteorological variables correlate with the growth of outdoor molds. We are now using machine learning with BigData from remote sensing and meteorology available from NASA and National Oceanic and Atmospheric Administration to simplify and enhance estimates of the probable growth and distribution of mold spores to more effectively address the health effects of mold exposure.

Six sites were strategically selected to cover both urban and rural areas of central Mississippi. Mold spore data was collected from these sites from November/December 2007 to April 2009 using 7-day volumetric Burkard® Spore Traps. Sections of tape from the spore traps were cut using a standardized grid and mounted on a glass slide for coverslip staining. The slides were viewed with a microscope to identify and count mold spores. Seven clinically relevant molds were found: Cladosporium cladosporioides, Cladosporium herbarum, Alternaria alternata, Epicoccum nigrum, Helminthosporium, Aspergillus, and Penicillium. Cladosporium and Alternaria are two of the most frequently found spores, and their size allows them to be inhaled easily.

Analysis showed that the number and type of mold spores vary drastically with the seasons. Response time to meteorological conditions on mold spore levels also varies with the seasons. Preliminary analysis indicates that the best predicting variables include temperature, precipitation, and solar radiation. In the cold season, the most significant predictor is temperature, then followed by rainfall. In the warm season, the most significant predictor is solar radiation.

Exposure to mold spore aeroallergens can trigger allergic reactions, such as hypersensitivity pneumonitis, allergic rhinitis, exacerbations of cardiovascular and chronic obstructive pulmonary diseases, and asthma. Alternaria is one of the main fungal causes of allergy. Because of their large size, Alternaria can deposit in the nose (nasal septum infections), mouth, and upper respiratory tract, causing an allergic response such as those mentioned above. Cladosporium is also a significant allergen that can severely affect asthmatics and people with respiratory diseases. Both Alternaria and Cladosporium are dominant in urban environment (bottom left photos).

Persons vulnerable to mold spore exposure can benefit from timely warnings of increased spore levels, and health care professionals can use this information to develop strategies to prevent some adverse outcomes. Currently, estimates of mold spore levels are based on the extrapolation of data from a limited number of ground-monitoring stations that are unavailable in many parts of the country, limiting the ability for making health-related decisions in these locales. Ground monitoring of mold spores involves manual work, including sample collection, slide preparation, and identifying and counting spores under microscopes, all of which make the process very expensive.

Previous studies show that meteorological variables, such as temperature, precipitation, humidity, soil moisture, and solar irradiance, correlate with the growth of outdoor molds.

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