Atmospheric and environmental changes impact organ-specific lupus flares

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New research findings presented at the 2019 ACR/ARP Annual Meeting found a strong association between changes in atmospheric and environmental variables 10 days before a clinic visit and organ-specific lupus flares in patients with systemic lupus erythematosus (Abstract #695).

Systemic lupus erythematosus, referred to as SLE or lupus, is a chronic disease that causes systemic inflammation which affects multiple organs. In addition to affecting the skin and joints, it can affect other organs in the body such as the kidneys, the tissue lining the lungs (pleura), heart (pericardium), and brain. Many patients experience fatigue, weight loss, and fever.

Knowledge of the role environmental exposures play in the development of SLE and their association to SLE activity might help rheumatologists identify modifiable risk factors and mechanisms that give rise to lupus, according to the authors of this study. They examined how changes in fine particulate matter (PM2.5) concentration, ozone concentration, temperature, resultant wind, relative humidity and barometric pressure may predict organ-specific lupus flares."Recent genome-wide association studies have identified more than 40 single nucleotide polymorphisms, which are important in lupus. Single nucleotide polymorphisms are the most common type of genetic variation among people but a relatively low percentage of people who have these genetic variations actually develop lupus, suggesting that environmental factors play an important role in lupus says George Stojan, MD, Assistant

Professor of Medicine, Johns Hopkins Lupus Center, and the study's lead author. "There is strong epidemiologic evidence of association with several environmental factors, including crystalline silica exposure, cigarette smoking, and exogenous estrogens as well as potential associations between other exogenous factors such as mercury, ultraviolet radiation, solvents and pesticides.

When it comes to atmospheric impact, data from the Hopkins Lupus Center previously described significant seasonal variation in SLE disease activity with more arthritis activity in the spring and summer months, and an increase in renal activity in winter months, significantly higher anti-dsDNA antibody titers in the fall, and a significant variation of global disease activity through the year. While several studies in the past attempted to correlate global SLE disease activity with atmospheric changes, this is the first study looking at the association of organ specific lupus flares with atmospheric changes prior to patient visits."

The study included 1,628 patients who fulfilled four of the 11 ACR or SLICC classification criteria for SLE. The data ranged from 1999 to 2017. The maximum span between visits was 110 days with one-month time aggregation units. Disease activity was expressed as Physician Global Assessment (PGA) taken at every patient visit. Lupus flare was defined as a PGA score increase of one point or more compared to the previous visit.

Environmental and atmospheric data was obtained from the U.S. Environmental Protection Agency (EPA), including PM2.5 and ozone concentration, temperature, residual wind, relative humidity and barometric pressure. The researchers calculated the average values of each factor 10 days prior to patient visit. They also built univariate and multivariate models to study the association of the variables with lupus disease activity. They adjusted the models for age, sex, income, racial distribution, and rural versus urban residence. They used multivariate

logistic regression to identify the significant determinants associated with lupus flares and performed regression for each organ flare outcome. They based regression inference on generalized estimating equations to account for the time repeated outcomes.

The study's results showed statistically significant associations between environmental factors and lupus in multiple areas. Rash, serositis, hematologic and joint flares were associated with an increase in temperature. Renal flares decreased as the temperature and ozone concentration increased. . Joint, neurologic, hematologic and pulmonary flares were associated with residual wind. Humidity was significantly associated with joint and serositis flares. PM2.5 concentration was significantly associated with rash, joints, serositis and hematologic flares.

While the study's findings show a strong association between changes in atmospheric and environmental variables 10 days prior to a patient clinic visit and organ-specific lupus activity at the visit, no environmental or atmospheric factor had a general association with all organ-specific lupus flares.

"These findings raise concern for a potentially significant impact of atmospheric changes on the occurrence of organ-specific lupus flares, but further studies are necessary to confirm this effect and to potentially explain it. Atmospheric effects may have an important impact on lupus clinical trial design and outcomes," says Dr. Stojan. "From a global perspective, these findings could implicate climate change and global warming as important factors in the rapidly changing epidemiology of lupus worldwide. Ultimately, these findings are the first step to vindicating the great majority of lupus patients who are convinced that their disease is influenced by weather changes and who inspired this research."

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More information: Study: Environmental and Atmospheric Factors in Systemic Lupus Erythematosus: A Regression Analysis