

Study: Why hot, humid air triggers symptoms in patients with mild asthma

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May is asthma awareness month, and with summer right around the corner, a study shows that doctors may be closer to understanding why patients with mild asthma have such difficulty breathing during hot, humid weather. The study, appearing in the June print issue of the *American Journal of Respiratory and Critical Care Medicine*, found that patients who inhaled an asthma drug before breathing in hot, humid air were able to prevent airway constriction that volunteers without asthma did not experience in the same environment.

Ipratropium, a drug occasionally used for [asthma](#), prevents airway [muscle contraction](#) and increases airflow to the lungs. Its success in combating the air temperature response suggests that hot, [humid air](#) triggers [asthma symptoms](#) by activating airway sensory nerves that are sensitive to an increase in temperature.

"We know that breathing cold, dry air induces airway constriction in asthmatics," said Don Hayes, MD, medical director of the Lung and Heart-Lung Transplant Program at Nationwide Children's Hospital. "But the effects that temperature increases have on airway function in these [patients](#) are generally overlooked. We know very little about the mechanisms that cause symptoms when asthmatic patients are exposed to hot, humid air."

Dr. Hayes and his colleagues at the University of Kentucky Medical Center (where Dr. Hayes was on staff prior to joining Nationwide Children's late last year) enrolled patients with mild asthma and healthy

controls in a study to assess their pulmonary reaction to hot, humid air. Six asthmatic patients (ranging from 21 years of age to 26) and six healthy subjects (between 19 and 46) were asked to breathe into a device designed to deliver air at certain desired temperatures and humidity levels. The device produced a humidified [gas mixture](#) of air either hot or room temperature. Subjects breathed via a mouthpiece into this free stream of air for four minutes and were asked to pant. Investigators measured participants' airway resistance before and for 16 minutes immediately following the challenge. They also measured body temperature, heart rate, arterial blood pressure and oxygen saturation before and afterward.

Results showed that breathing of hot, humid air triggered an immediate increase in airway resistance in patients with mild asthma, but caused either only a very small or no response in healthy subjects. Breathing hot, humid air also triggered consistent coughs in those with asthma. When the asthmatic participants used an ipratropium aerosol before the challenge, they did not experience airway constriction.

"We don't fully understand the mechanisms underlying these responses," said Dr. Hayes, who is the study's primary author.

A recent study by the same research group found that airway sensory nerves called C-fiber nerves were activated with the temperature within the chest was elevated to about 102 degrees Fahrenheit. These data were developed in Lu-Yuan Lee's, MD, laboratory at the University of Kentucky using animal models. Dr. Lee's laboratory has a 20-year history of National Institutes of Health funding to study C-fiber sensory nerves in the lung.

"When C-fiber [sensory nerves](#) are stimulated, a number of pulmonary defense reflex responses can occur, including cough and bronchoconstriction," said Dr. Hayes, also a faculty member at The Ohio

State University College of Medicine.

"This study is a good example of how we can translate findings from a research laboratory into a better understanding and more in-depth knowledge about how to prevent and treat diseases in patients," said Dr. Lee.

Dr. Hayes says further research is needed to completely understand how patients' bodies react to hot and humid air and is planning such studies at Nationwide Children's. Overall, he says that this data provides evidence to support that ambient air temperatures and [humidity levels](#) are very important in asthma and this research introduces potential new drug targets for the treatment of asthma.

Provided by Nationwide Children's Hospital

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