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Is Healthy Air in Charlotte's Future?

By Stephen R. Keener, MD, MPH, and Maeve E. O'Connor, MD

Does it seem like you are seeing more patients with respiratory problems today than you were 10 years ago? That's not just your imagination. There has been a noticeable increase in asthma and cardiovascular disease in the Charlotte region in the last few years, according to the American Lung Association (ALA). The poor state of Charlotte's air is partly to blame. Health professionals are wise to be informed of the current trends in regional air quality and how they may be impacting patient health.

In the American Lung Association's 2009 State of the Air report, the Charlotte metro region's air ranked eighth worst in terms of ozone pollution when compared to the nation's dirtiest cities, up from last year's 13th spot. According to the 2009 report, there was a 5 percent increase in the number of pediatric asthma cases and a 21 percent increase in adult asthma cases over the 2008 numbers. The ALA report also gives Charlotte a failing grade for its high levels of particle pollution. Fine particles are of special concern to those with cardiovascular problems. The number of cases of cardiovascular disease noted in the 2009 report increased 13 percent from the 2008 report.

Since the early 1990s, the Charlotte region has been in violation of the EPA's health-based standard for ozone and, while our region's air quality has improved somewhat, it's far from healthy. The Clean Air Act requires the EPA to consider only medical findings, not the cost of compliance, in setting federal air pollution standards. Medical research continues to show stronger correlations between dirty air and poor health, and standards are beginning to get more stringent.

Regional air quality doesn't meet the 1997 standard of .080 parts per million (ppm), nor does it meet the current standard of .075 ppm set last year by the EPA. It's expected the EPA will adjust the standard again within the coming year. Clearly, our region has a long way to go before our air quality can be considered healthy during ozone season.

Research shows physicians have a right to be concerned about Charlotte's high ozone numbers. New research from Princeton University reveals exposure to ozone levels currently considered safe (.075 ppm) has been shown to significantly impair lung function in healthy individuals. Researchers also found inhalation of .070 ppm ozone for 6.6 hours, well under the current EPA standard, can induce significant reduction in FEV1 — the volume of air a person can forcibly exhale in the first second — according to a report in the Aug. 1

issue of the *American Journal of Respiratory and Critical Care Medicine*. "The acute inhalation of ambient concentrations of ozone induces several health effects, including airway irritation and inflammation, decrements in pulmonary function, and symptoms of respiratory discomfort," Edward S. Schelegle, PhD, of the University of California Davis, and colleagues assert. The researchers found statistically significant decrements in FEV1 and increases in total subjective symptoms scores ($P < 0.05$) after exposure to mean ozone concentrations of .070, .080 and .087 ppm.

Another concern for an ozone hotspot like Charlotte is long-term exposure to high ozone levels. An article entitled "Long-term Ozone Exposure and Mortality" published in the March 2009 issue of the *New England Journal of Medicine*, reports on a study which analyzed 448,850 subjects over an 18-year period. Researchers concluded that prolonged exposure to ozone and/or particulate matter is linked to increased mortality rates. Every .010 ppm of additional ozone raises the death rate due to respiratory disease by 4 percent. In high ozone cities like Charlotte, researchers found citizens have as much as a 30 percent higher chance of dying from respiratory illness. The risk for other nonfatal respiratory diseases also is elevated. This study adds to the literature that already documents the increase of asthma and heart attacks when ozone levels peak.

Ozone is not the only danger lurking in Charlotte's air. Fine particulate matter, which is smaller than 10 microns, or one-tenth the diameter of a human hair, is especially harmful. These microscopic substances are too small to be filtered by the nose and mouth and can enter directly into the bloodstream. The burning of fossil fuels in power plants and vehicles, especially diesel engines, is a major contributor to fine particle pollution. The link between fine particles and cardiopulmonary disease has been established for two decades.

In June, the Health Effects Institute (HEI) published an extended analysis of the American Cancer Society's study linking particulate air pollution and mortality. This new appraisal of existing studies shows mortality rates among people exposed to the particles are twice as high as previously thought. The analysis was conducted by a team of researchers from the University of Ottawa, led by Dr. Daniel Krewski.

The current EPA maximum annual average standard for fine particles is 15.0 micrograms

per cubic meter. California has set a more stringent annual average standard of 12.0. Mecklenburg County fine particulate matter levels are 14.9 micrograms per cubic meter.

Our entire community needs to come together if we are to solve this major public health problem. Physicians have an important role to play. Your voice is stronger than you might think! Public officials value and respect the testimony of physicians who know the serious impact air pollution has on patient health. Clean Air Carolina (formerly Carolinas Clean Air Coalition), a local nonprofit organization working to improve air quality, has started a new initiative, Medical Advocates for Healthy Air, to provide health professionals an avenue for getting involved in the quest for clean air.

Simple actions — like adding your name to a medical sign-on letter supporting stronger regulation of air toxics, or submitting a joint letter to the editor or Op-ed column on the dangers diesel pollution from old school buses has on children's health — can make a difference in raising awareness. Educating your patients, colleagues and family members about the link between air pollution and illness also is an extremely important public service you can provide. More than 75 health professionals statewide have gotten involved in this effort and many more are needed if we are to have an impact. Lawrence W. Raymond, MD, Carolinas Medical Center, Maeve E. O'Connor, MD, Carolina Asthma and Allergy, and Stephen R. Keener, MD, Mecklenburg County Health Department are three of the leaders of this new initiative. We invite you to join us as we work together to help restore healthy air for the residents of the Charlotte region.

1. State of the Air: 2009. American Lung Association. April 29, 2009. www.stateoftheair.org/2009/states/north-carolina.
2. Schelegle E, et al "6.6-hour inhalation of ozone concentrations from 60 to 87 parts per billion in healthy humans" *American Journal of Respiratory and Critical Care Medicine*, 2009; 180: 265-72
3. Jerrett M. "Long-Term Ozone Exposure and Mortality", *New England Journal of Medicine*, 360:11. March 12, 2009.
4. Barringer, Felicity. "Analysis Finds Elevated Risk from Soot Particles in the Air". *The New York Times*. June 3, 2009.