Even healthy lungs labor at acceptable ozone levels

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Ozone exposure, even at levels deemed safe by current clean air standards, can have a significant and negative effect on lung function, according to researchers at the University of California Davis.

"The National Ambient Air Quality Standard (NAAQS) for ozone was recently revised to set lower limits for ozone concentrations. Our research indicates that the threshold for decrements in ozone-induced lung function in healthy young subjects is below this standard," said Edward Schelegle, Ph.D., of the University of California Davis. "Specifically, we found that 6.6 hours exposure to mean ozone concentrations as low as 70 parts per billion have a significant negative effect on lung function, even though the current NAAQS standards allow ozone concentrations to be up to 75 parts per billion (ppb) over an eight-hour period."

The results we published in the August 1 issue of the American Thoracic Society's American Journal of Respiratory and Critical Care Medicine.

To test whether mean ozone concentrations above and below the new standard induce lung function decrements and to further study the time-course of these decrements, Dr. Schelegle and colleagues recruited 31 healthy nonsmoking individuals to participate in 6.6-hour sessions during which they were exposed to ozone at 60, 70, 80 or 87 ppb or filtered air while undergoing six 50-minute bouts of moderate exercise followed by 10-minute breaks. A 35-minute lunch break separated the third and fourth bouts of exercise.

Lung function for each subject was assessed before, during and after exposure, and each individual answered a questionnaire evaluating their subjective symptoms. Of the four levels of ozone concentration tested, Dr. Schelegle and colleagues found significant decrements in both lung function and subjective respiratory symptoms at 70 ppb and above, beginning at 5.6 hours after exposure.

"These data tells us that even at levels currently below the air quality standard, healthy people may experience decreased lung function after just a few hours of moderate to light exercise such as bicycling or walking," said Dr. Schelegle. "While these changes were fully reversible within several hours, these findings highlight the need to study susceptible individuals, such as asthmatics, at similar ozone concentrations and durations of exposure. These studies are needed to better understand the acute rise in hospitalizations that often occur in conjunction with high-ozone periods."

The study also supports the previously reported smooth dose-response curve associated with ozone. That is, the higher the level of ozone, the greater the decrease in lung function. However, the healthy subjects in the study showed a marked individual variability in their responses to ozone, with a few exhibiting strong sensitivity to ozone concentrations. What causes some individuals to respond strongly while others do not is still unknown.

"Schelegle and colleagues do not, nor did they seek to explain the determinants of susceptibility in young, healthy adults," noted James S. Brown, of the U.S. Environmental Protection Agency, in an accompanying editorial. "Only with continued research efforts will we be able to better characterize the susceptibility in some healthy individuals, to the effects of short-term ozone exposures."

Dr. Schelegle also notes the need for further research to further elucidate

the precise mechanisms that determine an individual's ozone responsiveness in both healthy and susceptible populations. "Understanding how these mechanisms change with repeated daily exposures is critical, especially as ambient ozone levels are often elevated several days in a row," Dr. Schelegle said.

Source: American Thoracic Society (news : web)