SMOG—Who Does It Hurt?

What You Need to Know About Ozone and Your Health

On a hot, smoggy summer day, have you ever wondered: Is the air safe to breathe? Should I be concerned about going outside? In fact, breathing smoggy air can be hazardous because smog contains ozone, a pollutant that can harm our health when there are elevated levels in the air we breathe.

Background: What is Ground-level Ozone?

- Ozone is not emitted directly into the air, but is formed by gases called nitrogen oxides (NOx) and volatile organic compounds (VOCs) that in the presence of heat and sunlight react to form ozone. Ground-level ozone forms readily in the atmosphere, usually during hot weather.
- NOx is emitted from motor vehicles, power plants and other sources of combustion. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants, refineries, factories, consumer and commercial products, and other industrial sources.
- Changing weather patterns contribute to yearly differences in ozone concentrations from city to city. Also, ozone and the pollutants that cause ozone can be carried to an area from pollution sources located hundreds of miles upwind.

Why are We Concerned about Ground-Level Ozone?

- Ozone is the prime ingredient of smog in our cities and other areas of the country. Though it occurs naturally in the stratosphere to provide a protective layer high above the earth, at ground-level it is the prime ingredient of smog.
- When inhaled, even at very low levels, ozone can:
    - cause acute respiratory problems;
    - aggravate asthma;
    - cause significant temporary decreases in lung capacity of 15 to over 20 percent in some healthy adults;
    - cause inflammation of lung tissue;
    - lead to hospital admissions and emergency room visits [10 to 20 percent of all summertime respiratory-related hospital visits in the northeastern U.S. are associated with ozone pollution]; and
    - impair the body's immune system defenses, making people more susceptible to respiratory illnesses, including bronchitis and pneumonia.

Who is Most at Risk from Exposure to Ground-Level Ozone?

- Children are most at risk from exposure to ozone:
    - The average adult breathes 13,000 liters of air per day. Children breathe even more air per pound of body weight than adults.
    - Because children's respiratory systems are still developing, they are more susceptible than adults to environmental threats.
    - Ground-level ozone is a summertime problem. Children are outside playing and exercising during the summer months at summer camps, playgrounds, neighborhood parks and in backyards.

- Asthmatics and Asthmatic Children:
    - Asthma is a growing threat to children and adults. Children make up 25 percent of the population and comprise 40 percent of the asthma cases.
    - Fourteen Americans die every day from asthma, a rate three times greater than just 20 years ago. African-Americans die at a rate six times that of Caucasians.
    - For asthmatics having an attack, the pathways of the lungs become so narrow that breathing becomes akin to sucking a thick milk shake through a straw.
    - Ozone can aggravate asthma, causing more asthma attacks, increased use of medication, more medical treatment and more visits to hospital emergency clinics.

- Healthy Adults:
    - Even moderately exercising healthy adults can experience 15 to over 20 percent reductions in lung function from exposure to low levels of ozone over several hours.
    - Damage to lung tissue may be caused by repeated exposures to ozone -- something like repeated sunburns of the lungs -- and this could result in a reduced quality of life as people age. Results of animal studies indicate that repeated exposure to high levels of ozone for several months or more can produce permanent structural damage in the lungs.
    - Among those most at risk to ozone are people who are outdoors and moderately exercising during the summer months. This includes construction workers and other outdoor workers.

How does Ground-Level Ozone Harm the Environment?

- Ground-level ozone interferes with the ability of plants to produce and store food, so that growth, reproduction and overall plant health are compromised.
- By weakening sensitive vegetation, ozone makes plants more susceptible to disease, pests, and environmental stresses.
- Ground-level ozone has been shown to reduce agricultural yields for many economically important crops (e.g., soybeans, kidney beans, wheat, cotton).

- The effects of ground-level ozone on long-lived species such as trees are believed to add up over many years so that whole forests or ecosystems can be affected. For example, ozone can adversely impact ecological functions such as water movement, mineral nutrient cycling, and habitats for various animal and plant species.
- Ground-level ozone can kill or damage leaves so that they fall off the plants too soon or become spotted or brown. These effects can significantly decrease the natural beauty of an area, such as in national parks and recreation areas.
- One of the key components of ozone, nitrogen oxides, contributes to fish kills and algae blooms in sensitive waterways, such as the Chesapeake Bay.

What Can I do to Avoid Unhealthy Exposure to Ozone?

You can take a number of steps. The chart at the end of this publication tells you what types of health effects may occur at specific ozone concentrations and what you can do to avoid them. If you are a parent, keep in mind that your children are likely to be at higher risk, particularly if they are active outdoors. You may therefore want to pay special attention to the guidance for sensitive groups.

In general, when ozone levels are elevated, your chances of being affected by ozone increase the longer you are active outdoors and the more strenuous the activity you engage in. Scientific studies show that:

- At ozone levels above 0.12 ppm, heavy outdoor exertion for short periods of time (1 to 3 hours) can increase your risk of experiencing respiratory symptoms and reduced lung function.

- At ozone levels between 0.08 and 0.12 ppm, even moderate outdoor exertion for longer periods of time (4 to 8 hours) can increase your risk of experiencing ozone-related effects.

EPA recommends limiting outdoor activities as ozone levels rise to unhealthy levels. You can limit the amount of time you are active outdoors or your activity level. For example, if you're involved in an activity that requires heavy exertion, such as running or heavy manual labor (see "What does exertion have to do with ozone-related health effects?" below), you can reduce the time you spend on this activity or substitute another activity that requires less exertion (e.g., go for a walk rather than a jog). In addition, you can plan outdoor activities when ozone levels are lower, usually in the early morning or evening.

Note: This information was taken from EPA publications.