Ozone (O_3)

Ozone can be “good” or “bad” for health and the environment depending on where it’s found in the atmosphere. Stratospheric ozone is “good” because it protects living things from ultraviolet radiation from the sun. Ground-level ozone, our concern here, is “bad” because it can trigger a variety of health problems.

How is it formed?

Ozone is formed in the atmosphere through chemical reactions between pollutants emitted from vehicles, factories and other industrial sources, fossil fuels, combustion, consumer products, evaporation of paints, and many other sources. Hydrocarbons and nitrogen oxide gases react in the presence of sunlight to form ozone. Hot, sunny, and calm weather promotes ozone formation. Ozone has a very characteristic pungent odor, and it can sometimes be detected after lightning strikes or during electrical discharges. Individual humans vary in their ability to smell ozone; some people can smell it at levels as low as 0.05 ppm.

What are the health impacts?

Inhalation of ozone causes inflammation and irritation of the tissues lining human airways, leading to a variety of symptoms. Exposure to ozone can reduce the volume of air that the lungs breathe in and cause shortness of breath. Ozone in sufficient doses increases the permeability of lung cells, rendering them more susceptible to toxins and microorganisms. The occurrence and severity of health effects from ozone exposure vary widely among individuals, even when the dose and the duration of exposure are the same.

According to the EPA, depending on the level of exposure ozone can:

- Cause coughing and sore or scratchy throat.
- Make it more difficult to breathe deeply and vigorously and cause pain when taking a deep breath.
- Inflame and damage the airways.
- Make the lungs more susceptible to infection.
- Aggravate lung diseases such as asthma, emphysema, and chronic bronchitis.
- Increase the frequency of asthma attacks

Some of these effects have been found even in healthy people, but effects can be more serious in people with lung diseases such as asthma. They may lead to increased school absences, medication use, visits to doctors and emergency rooms, and hospital admissions.

Long-term exposure to ozone is linked to aggravation of asthma and is likely to be one of many causes of asthma development. Studies in locations with elevated concentrations also report associations of ozone with deaths from respiratory causes.

Statutory Limits

	1-Hour Average	8-Hour Average
National Ambient Air Quality Standard	–	0.070 ppm*
California Ambient Air Quality Standard	0.09 ppm*	0.070 ppm*

* A part per million (ppm) refers to one part of a substance dissolved into a million parts of another substance.