

## Ozone good or bad? Ozone air pollution, Pakistan

Ozone is a type of oxygen. Normal oxygen that we inhale is made up of two atoms of oxygen (O<sub>2</sub>) whilst ozone is made up of three atoms (O<sub>3</sub>). Ozone is very important for human survival on earth but can also be harmful to human body. Ozone is one of the pollutants in the air and cause various health issues. In this article, we will discuss about the good and bad effects of ozone on humans in Pakistan and across the globe.

### What is ozone?

Ozone is present in our atmosphere in a very tiny fraction. The space containing air around the globe is classified into various layers/zones. The troposphere zone is first layer and is about 10 km around the globe. Stratosphere is outer zone, between 10-30 km around the globe. Majority of the ozone (>90%) is present in stratosphere.

Ozone has slight pungent irritating effects when inhaled. It has very light blue color, hence the sky is light blue in color. The ultraviolet radiation (UV light) converts oxygen into ozone, and it blocks transmission of UV light to troposphere albeit not 100%.

### How ozone produced in tropospheric zones?

The ozone which we inhale is produced almost entirely due to human made processes and events. The major source is burning of fossil fuel in motor vehicles, industries and power stations which lead to production of various nitrogen oxide compounds along with volatile organic compounds (VOCs) or hydrocarbon. These chemicals react with each other in strong sunlight and produce ozone in the air. This ozone is transferred across the area by wind gust and can be detected way far from its original site of production.

The ozone production is much high during warmer months than cold months when smog is more predominant issue.

### Beneficial effects of ozone:

The ozone in outer atmosphere blocks most of harmful UV light which is associated with increased risk of skin cancers including melanoma which is very aggressive skin cancer. It also increases the risk of getting sunburn. The areas around the globe which has less ozone in their outer atmosphere (e.g., Australia) or have "holes" in the ozone layer have higher risk of developing various skin cancers.

### Bad effects of ozone on health:

Ozone can cause various issues on human.

#### 1. Eye problems

Very high levels of ozone in the air can cause strong irritation in the eyes, making them red and weepy. It can increase the risk of infection in the eye.

#### 2. Effects on nose and throat

Ozone is very irritating to nose and throat lining, causing nose/throat discomfort, itching, sneezing, nasal discharge, cough, or effects on the voice.

### **3. Effects on the lungs:**

Ozone is quite toxic to the lung lining. It causes strong inflammation due to oxidative stress, releases further inflammatory mediators from the cells which lead to cell damage, contraction of muscles around the airways making them narrow and increase mucus production. This results in cough, sputum production, breathlessness, and chest discomfort.

These effects can be quite marked in patients who have chronic lung and heart diseases like asthma, COPD, emphysema, and ischemic heart disease. This is further exacerbated by other pollutants including fine particulate matter.

### **4. Vulnerable population:**

The most vulnerable populations are young and elderly individuals. The lungs are still developing in younger people, and these may not develop fully due to effects of pollutants in individual living in high ozone areas. The elderly have less lung reserve and feel the effects of ozone the most. The individuals working in open air (labourers and farmers) are also at increased risk due to total exposure due to their nature of outdoor work. High ozone contents in the air can affect the development of baby in mothers' womb too.

### **What should be done to tackle ozone issue?**

Ozone is one of the pollutants, produced from burning of fossil fuels. Not that only it causes pollution, it also leads to climate change, increases in global temperature and extremes of weather events. Controlling ozone pollution requires concrete measures from all countries and people. Fossil fuel use should be minimised whilst developing clean energy solutions. We need to regulate our motor vehicle industry and its maintenance and industrial pollution needs to be stopped.

People at risk like asthmatic should avoid outdoor activities at time of high ozone levels, usually around the middle of the day. If they suffer from it, they should consult their doctors to optimize their medical therapy.

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