

Harmful effects of UV Rays on Humans:

- It causes skin cancer.
- UV rays cause skin burn.
- Over-exposure to UV radiation weakens the immune system.
- Prolonged exposure to UV rays damages the tissues of the eyes and can cause a 'burning' of the eye surface known as 'snow blindness'.
- UV rays also speed up the aging of the skin.

Factfile: Scientists working in Antarctica wear high-factor sunscreen to avoid sunburn when working outside, especially as sunlight is also reflected from the snow surface. You can get burnt in as little as five minutes without it!

Preventive measures to save our planet Earth:

- Use of products which has Chlorofluorocarbons (CFCs) such as hair sprays fresheners, cosmetics, and aerosol in plastic containers should be avoided.
- Promote activities such as tree planting and backyard gardening.
- Use Environmental-friendly fertilisers.
- Prevent excessive smoke emission from your vehicle which causes air pollution. Save on gasoline and crude oil by regular maintenance.
- Do not burn plastics and rubber tires.



International Day for the Preservation of the Ozone Layer (World Ozone Day) is observed on 16 September every year to spread awareness about the harmful effects of Ozone layer depletion and ways to find out preventive measures. This year the theme is ***"Montreal Protocol: Keeping us, our Food & Vaccines cool."***

Brief History:

On 22 March 1985, the Vienna Convention for the Protection of the Ozone Layer was adopted and signed by 28 countries. In September 1987, this led to the drafting of The Montreal Protocol on Substances that Deplete the Ozone Layer and marks the International Day for the Preservation of the Ozone Layer (World Ozone Day). The objective of the 1985 Vienna Convention is to preserve human health, and to protect the environment from any harmful effects of the depletion of the ozone layer. The objective of the 1987 Montreal Protocol is to repair the ozone layer through the worldwide control, reduction and ultimately elimination of production and consumption of Ozone Depleting Substances (ODS). Basically, it is an international treaty planned to protect the ozone layer by reducing the production of substances supposed to be responsible for ozone layer depletion. The Montreal Protocol was implemented on 1 January, 1989.

The Vienna Convention and the Montreal Protocol became the first treaties in the history of the United Nations to achieve universal ratification on 16 September, 2009.

On 15 October, 2016, at the 28th meeting of the parties to the Montreal Protocol on Substances that Deplete the Ozone layer reached an agreement in Kigali, Rwanda to phase-down and regulate hydrofluorocarbons (HFCs) as well. This agreement is known as ***Kigali Agreement***. These chemicals are currently in use as a substitute for ozone-depleting substances, but are themselves potent greenhouse gases.



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The Montreal Protocol on Substances that Deplete the Ozone Layer is the landmark multilateral environmental agreement that regulates the production and consumption of nearly 100 man-made chemicals referred to as ozone depleting substances (ODS).

How was Ozone Hole discovered?

In the stratosphere of Earth's atmosphere, there exists a protective shield called the ozone layer. This layer is responsible for absorbing and preventing harmful UV rays from penetrating the Earth's surface. It is the stratosphere that contains a more considerable amount of ozone layer compared to other segments.

With the growth of industrialization and increase in pollution, harmful substances have decreased the quality of air around us. Not just that, they are known to reduce or, in other words, deplete the concentration of the ozone layer. In the mid-1980s, scientists **Joe Farman, Brian Gardiner and Jonathan Shanklin**, the first ozone depletion was found over the Antarctic region. The hole – caused by Ozone-Depleting Substance (ODS) used in aerosols and cooling, such as refrigerators and air-conditioners – was threatening to increase cases of skin cancer and cataracts, and damage plants, crops, and ecosystems.

The scientific confirmation of the depletion of the ozone layer prompted the international community to establish a mechanism for cooperation to take action to protect the ozone layer

In the 1970s concern about the effect of man-made chemicals, especially chlorofluorocarbons (CFCs), on the ozone layer were raised by **Paul Crutzen, Mario Molina and Sherwood Rowland**. Their pioneering work was recognised in 1995 by the award of the Nobel Prize in Chemistry.

If you took all the ozone in a vertical column above the instrument and brought it down to sea level it would form a layer just three millimetres thick.

What is the Ozone Layer?

The ozone layer, a fragile shield of gas, protects the Earth from the harmful portion of the rays of the sun, thus helping preserve life on the planet. In 1957, Professor Gordon Dobson of Oxford University discovered the ozone layer. Ozone is made up of three atoms of oxygen.

It is a highly reactive gas and is represented by O_3 . It occurs naturally in the Earth's atmosphere (15-35 km above Earth) in the stratosphere and has relatively high concentrations of ozone (O_3). Naturally, it is formed through the interactions of solar ultraviolet (UV) radiation with molecular oxygen O_2 . It reduces the harmful UV radiation reaching the Earth's surface.

Causes of Ozone Depletion:

The main cause of depletion of the Ozone layer is human activity mainly human-made chemicals that contain chlorine or bromine.

These chemicals are known as ODS that is Ozone - Depleting Substances. Since the early 1970's scientists observed a reduction in stratospheric ozone and it was found more prominent in Polar Regions. The chief ozone-depleting substances include **chlorofluorocarbons (CFCs), carbon tetrachloride, hydrochlorofluorocarbons (HCFCs), and methyl chloroform. Halons**, sometimes known as **brominated fluorocarbons**, also contribute mightily to ozone depletion. ODS substances have a lifetime of about 100 years.

Do you know that one molecule of chlorine has the capability to break down thousands of ozone molecules?

Do You Know?

Ozone in the atmosphere is measured using the Dobson Spectrophotometer – equipment designed in the 1920s, but still the world standard. Ozone is measured in Dobson Units, DU and a typical measurement is about 300 DU.

An ozone hole is defined as an area of the atmosphere having ozone values less than 220 DU.

What are the effects of Ozone depletion?

Ozone is responsible for shielding the UV rays from the sun; its depletion may cause severe health hazards. Ozone depletion also impacts the environment adversely by altering the life cycles of plants and disrupting the food chain. Microscopic organisms such as plankton may not survive hence animals dependent on planktons will also not be able to survive. The depletion of the ozone layer may result in a change in wind pattern, leading global warming hence resulting in climatic changes all over the world.