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CAUSES AND EFFECTS OF DEPLETION OF OZONE LAYER

The ozone layer refers to the layer in the lower stratosphere that contains high concentrations of ozone gas (O3). This layer was formed approximately 2 billion years ago because of the increase in the amount of atmospheric oxygen (Aggarwal et al. 1990). Ozone is usually found in both the tropospheric and stratospheric zones. Most of the Sun's ultraviolet radiation that could be damaging for the living organisms on the Earth is absorbed by this layer before it gets into the atmosphere (Rinkesh par. 2). Overall, the layer plays a critical role in the biology, as well as climatology, of the Earth's environment. This essay will discuss the causes and effects of the ozone layer depletion.

An area where the ozone layer is depleted is known as an ozone hole. However, the term is only applicable to areas where the depletion level is below 200 Dobson units (Reddy and Sivasakthivel 30). One of the major causes of ozone depletion is chlorofluorocarbons (CFCs). Chlorofluorocarbons are chemicals that contain bromine and chlorine, both of which are principle ozone depleting elements. Usually, CFCs are

non-combustible and volatile. As such, they evaporate easily and get into the stratosphere. Notably, even though CFC emissions have reduced in the developed countries largely owing to the various global control agreements, the destruction of the ozone layer is expected to continue in the 21st century (Aggarwal et al. 1993).

Another common cause of the ozone layer depletion is global warming. Owing to global warming and the subsequent greenhouse effect, a large amount of heat is trapped just below the stratosphere. Consequently, the heat does not reach the troposphere, which makes it rather cold. Notably, the ozone layer needs maximum heat and light from the Sun, which means that the mentioned blockage causes the depletion of the ozone layer (Anwar et al. 130). Similarly, the depletion of the ozone layer may be caused by unregulated rocket launches. Some studies have indicated that unregulated rocket launches could cause more damage to the ozone layer than CFCs. Moreover, the studies show that the ozone layer depletion due to these launches will surpass that caused by CFCs by 2050 given the predicted growth of the aerospace industry (Reddy and Sivasakthivel 33).

The accumulation of nitrogenous compounds due to human activities also causes the depletion of the ozone layer. Some of these compounds include, but are not limited to, N0, N20, and N02 (Anwar et al. 130). Finally, the ozone layer depletion may also be caused by natural phenomena, such as stratospheric winds and sunspots. However, this has only been found to contribute to 1-2% of overall depletion. Furthermore, this depletion is usually temporary. Another natural factors that caused the

depletion of the ozone layer were the big volcanic eruptions of Mt. Pinatubo and El Chichon in 1991 and 1983 respectively (Rinkesh par. 8).

The depletion of the ozone layer causes the penetration of harmful UV radiation into the Earth's atmosphere. Such radiation has the potential of harming not only humans but also aquatic and plant life on the planet. One of the principle impacts of this depletion on humans is the weakening of the immune system and the formation of skin patches. The skin damage is a direct result of the destruction of melano-cyte cells (Aggarwal et al. 1993). It can also come in the form of sun-burns that emerge due to the faster flow of blood through the capillaries. In some cases, the exposure to UV radiation can cause skin cancer, breast cancer, and leukemia. In addition, the exposure of the eyes to UV radiation due to the ozone layer depletion destroys the lens and cornea, which can, in turn, cause cataract, photokeratitis, and blindness. The excess exposure also causes the breakage of DNA and alters DNA replication. Accordingly, it can cause the premature aging of humans (Aggarwal et al. 1993).

For the terrestrial and aquatic life, the ozone layer is invaluable because it facilitates terrestrial plant evolution through the creation of phenolic polymer breakdown triggered by UVB. Exposure to UVB has thus been associated with the damage of both plants' nuclear DNA and proteins (Aggarwal et al. 1993). Accordingly, leaves and young buds are considered as the most vulnerable parts of mature plants. The impact of UVB on DNA causes the emergence of cryptic transposable elements in certain species, which can result in dangerous DNA mutations. For example, animal

studies have shown that such mutations may even cause the degeneration and death of cells (Reddy and Sivasakthivel 35).

For plants in general, the depletion of the ozone layer causes food shortage, which threatens their survival. Essentially, UV radiation disturbs the physiological and developmental processes in plants, which reduces their growth. Even though the exposure to UV may lead to the reduction in plant production, some studies have also indicated that some levels of UV radiation can be leveraged to enhance crop yield. This can be achieved through the application and utilization of phytohormones (Anwar et al. 132).

In conclusion, the depletion of the ozone layer is expected to continue in the 21st century due to human activity. Today, chlorofluorocarbons are the principle contributors to the ozone layer depletion. Consequently, it is important to ban the usage and production of substances containing these compounds or to find alternatives. Other causes of depletion include nitrogenous compounds, global warming, and natural events, such as volcanic eruptions. The effects of the ozone layer depletion include skin cancer, reduced immunity, blindness, breast cancer, and leukemia in humans. In plants and the terrestrial ecosystem in general, the exposure to UV radiation tampers with the physiological and biological processes related to growth. Thus, the process of depletion threatens not only humans but also other living organisms on the Earth.