Dr.Nadia Mohammed

Many of human activities are badly affecting the atmosphere. Ozone depletion is one of those examples. Life is protected from UV rays by stratospheric ozone layer which acts as a shield or sunscreen. Approximately 90% ozone is present in stratosphere at the height of 10 to 17 kilometer and is called ozone layer while remaining 10% is present in troposphere. Medium frequency UV radiations (200 nm to 315 nm) are absorbed 97 to 99% by the ozone layer. Ozone (O_3) is colorless just like oxygen (O_2) but it has very harsh odour. It is very rare as compared to oxygen. It is estimated that out of 10 million air molecules about 2 millions are of O_2 and only 3 are of ozone. The process of ozone formation is called as photolysis. When the UV radiations from sun strike the O_2 molecules, it causes splitting of O_2. Oxygen molecules react with oxygen atoms in the upper atmosphere to form ozone. Stratospheric ozone is measured from the ground in units called "Dobson Unit" (D.U). Normal ozone concentration is between 300 - 350 D.U. In our present study.

Ozone Layer

The ozone layer is basically naturally occurring gas in the region of stratosphere where ozone particles are accumulated. Ozone layer is also naturally broken down but there is a balance between its formation and natural depletion. As a result the total amount of ozone remains constant. But ozone layer thickness varies with altitude and seasonal change. Ozone concentration is highest between 19 - 23 km. Most of ozone is formed at equator where there is maximum sunshine but with winds it travels at high altitude and get accumulated in stratosphere.

Ozone Hole

Ozone hole is created in the region where ozone layer has been depleted. The term "Ozone hole" is applied when the depletion level is below 200 Dobson Unit (D.U). Ozone holes are first discovered in Antarctica in 1970. Few years ago ozone holes are also discovered in arctic region. Since 2000 rate of ozone depletion is increasing 0.5 percent per year. Due to depletion of Ozone UV rays are penetrating in troposphere and leading to more ozone formation in troposphere which is causing injurious effects on our health as ozone is toxic for our body.

3. Causes of Ozone Depletion

3.1. Chlorofluorocarbons

Ozone depletion occurs when the natural balance between the production and destruction of stratospheric ozone is disturbed. Although natural phenomenon can cause ozone depletion but human activities such as CFCs are now accepted as major cause of depletion. All ozone depleting chemicals contain chlorine and bromine. CFCs are highly volatile and noncombustible so they are very quickly evaporated and can easily reach in stratosphere where ozone is present here they start depleting ozone molecules. These CFCs have also adverse effects on human health. According to the chemical model for ozone destruction proposed about 20 years ago, the photolysis of Cl_2O_2 is key to ozone depletion reaction. But now atmospheric researchers studied that the rate of this reaction is not extremely high as it was thought previously so we can no

Longer say that CFCs are the main cause of ozone depletion.

3.2. Unregulated Launches of Rockets

Another major cause of large scale ozone depletion is Rocket launches. It has been studied that unregulated rocket launches can result in much more ozone depletion than CFCs. It is estimated that if rocket launches will be let unregulated then it would cause huge ozone loss by the year 2050 than the CFCs have done.

3.3. Global Warming

Global warming also leads to ozone layer depletion. Due to global warming and greenhouse effect most of the heat is trapped in troposphere which is the layer below the stratosphere. As we all know ozone is present in stratosphere so heat don't reaches troposphere and it remain cold as recovery of ozone layer requires maximum sunlight and heat so it leads to depletion of ozone layer.

3.4. Nitrogenous Compound

Nitrogenous Compounds emitted by human activities in small amount like NO, N_2O and NO_2 are considered to be greatly responsible for the depletion of ozone layer.

4. Effects of Ozone Depletion

Ozone depletion is affecting the human health and environment negatively, as it allows the penetration of UV radiations to reach the Earth. These radiations can cause severe diseases in humans such as skin cancer, eye damage and genetic mutations etc. . Furthermore the ozone depletion is affecting the aquatic life, biogeochemical cycles, and air quality and also contributing in Global warming but in this review paper our main focus is on the effects of ozone depletion on human health.

4.1. Effects on Eyes

The major cause of blindness in this world is cataracts. There would be 0.3% - 0.6% increase in risk of cataract if there will be 1% decrease in Ozone level. Eye lens can be damaged by oxidative agents. Oxidative oxygen produced by UV radiation can severely damage eye lens and cornea of eye is also badly damaged by UV radiation. Photo keratitis, cataract, blindness all are caused due to UV rays.

4.2. Effects on Skin

Exposure to UV radiations can cause skin cancer. UV radiations alter the structure of biomolecules and thus lead to different diseases Skin is the most often exposed part of body to UV radiations there are two types of skin cancer, Melanoma and Non-melanoma. Melanoma is most serious form of cancer and is often fatal, while non-melanoma is most common type and less fatal. Depletion of ozone layer leads to both Sun burn and skin cancer UV radiations are also responsible for breast cancer and leukemia.

Epidemiological studies of Melanoma indicate that the incidence of melanoma is increasing in those countries having high ratio of cases. As UV radiations can penetrate more easily in thin skin so there is greater number of incidence is found in thin skinned people. It is found that the incidence of Melanoma is more in children than adults. The chance of incidence of melanoma is correlated with UV exposure furthermore the

survival chance of melanoma is less in boys as compared to girls . As the intensity of radiation increases in summer so the risk of melanoma in thin skinned people is increased in summer and it is more in females as compared to males as their skin is thinner than males.
There is considerable relationship between melanoma risk and intermittent sun exposure and sunburn history. There is also a direct relationship between air travelling and melanoma incidence. However the studies revealed that genetic factors contribute more for having melanoma disease than behavioral aspects. The epidemiological studies of non-melanoma skin carcinoma (NMSC) indicates that its risk is more in young females in lower limbs and sunbathing increases its risk five times in trunk region.

4.3. Effects on Human Immunity

Exposure to UV radiations can also result in suppression of immune response to skin cancer, infectious diseases and other antigens. The immunosuppression is due to changes in skin photoreceptors and antigen presenting cells that are brought by UV radiations. More increase in depletion of ozone results in more decrease in immune system.

4.4. DNA Damage and Lung Diseases

Short exposure to UV-B radiations can cause the DNA damage because UV radiations can disturb biomolecules such as lipids, proteins and Nucleic acids. Due to UV-B radiations there would be cryptic transposable elements which may lead towards the mutations which is more dangerous than the immediate DNA damage. Excessive UV-B radiation exposure results in the basal and squamous cells carcinomas. These types of cancers are induced due to transcriptional errors during DNA replication which are caused by changes in pyrimidine bases. The ultimate cause of this whole mechanism is found to be the prolonged exposure to UV radiations. It is estimated that there is increase of 2% of incidence of these cancers by 1% depletion of ozone layer. Exposure to UV radiations equally affects lungs. Bronchitis, obstruction of lungs, Emphysema, asthma all can be resulted from UV radiations exposure.

4.5. Effects of Hydrogen Peroxide on Human Health

Due to stratospheric ozone layer depletion UV radiations are penetrating in earth atmosphere which result in the production of reduced oxygen. Highly reactive species like hydrogen peroxide is produced which has bad effects on human health. It is ideal photochemical maker due to its long life and stability. Hydrogen peroxide is toxicant and it pollutes drinking water especially in lakes and makes water toxic and unfit for drinking. IT alters redox chemistry of metals that are used by our body like iron copper and manganese.

4.6. Effect of Food Shortage on Human Population

Depletion of ozone layer is also causing the problem of food shortage to humans. UV radiations are disturbing developmental and physiological processes which is decreasing the productivity of crops. As humans are heavily dependent on crops for food so there is a great chance if depletion of ozone layer is not checked it may cause seriously shortage of food to humans. Researches also show that UV radiations can also be used to enhance yield of crops by the use and application of phytohormones.