

# Radiation Hazards: Causes and its Impacts

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**Abstract-** *In the second world war, nuclear weapons were used in Japan. At that time the knowledge of nuclear energy was limited to a few developed countries and was in the control of their military. After that many countries have started to use radioactive element for many beneficial purposes as well as making nuclear weapons. Recently there is a competition between the countries of the world for increasing nuclear weapons. Due to some immature leadership in some countries, these weapons are not in a safe hand. So it is necessary to get knowledge of radiation hazards generated due to misuse of nuclear sources. The nuclear sources like uranium, radium and thorium are risky. Due to spread of atomic and nuclear weapons and nuclear terrorism, there is a risk of nuclear war between different countries. The risk can be avoided or minimised by certain agreements between nations. In the year 1969, the Non-proliferation Treaty was drafted for governments possessing nuclear weapons and signed an agreement for using nuclear sources for peaceful purposes. Other risks like reactor accident, radiations and nuclear waste disposal can be taken into consideration. The people suffers by nuclear radiations depending upon the level of its exposure. In comparison with peaceful use of nuclear technology like electricity generation, medical diagnosis treatment, the health risk is very small. The safe use of nuclear technology is beneficial for the world for environmental cleaning and for increasing food supply. Nuclear power technology is the best source of energy.*

## I. INTRODUCTION

Nuclear hazards is the result of unwanted radiation emitted in the atmosphere. These radiations are able to effects the universe, the solar system and the earth. The intensity of the radiations coming from the Sun towards the earth is very high but it can be decreased by the atmosphere surrounding the earth. Natural radioactive sources are found in rocks, air, water and in all organisms. The earth's magnetosphere have Van-Allen radiation Belt so some of the radiations get trapped by this magnetic field. Use of X-rays, nuclear fallout from nuclear explosions, power plants, radioactive materials, radioactive sources in research laboratories, industrial plants and hospitals, waste from nuclear fuels, mining and processing radioactive products all are sources of manmade radiations. Man and all life forms on earth have evolved in a radiation environment. All nonliving substances and generation of living beings are exposed to neutral radiations. This is inevitable. The air which we are breathing, the water which

we are drinking and the food which we are eating all are parts of same environment and contain radioactive material though in small amount. It is necessary to know that our body contains amounts of the radioactive isotopes Potassium( K40 ) and Carbon (C14).

## II. TYPES OF RADIATIONS

Atomic Radiation :

An atom of certain elements emits spontaneously very minute particles and electromagnetic radiations. These tiny particles may carry electrical charge as in the case of  $\alpha$ -rays and  $\beta$ -rays or they may be neutral like Neutrons. The EM rays and the gamma rays do not carry any charge. Radioactivity is the result of spontaneous disintegration of an atom during which it emits  $\alpha$ ,  $\beta$  and  $\gamma$  rays. Simultaneously the atom changes into another element which is itself radioactive and this in turn disintegrates to become something else and this process repeated. This is nuclear chain reaction.

$\alpha$  – rays :

Alpha rays consists of heavy doubly charged particles emitted by atoms like Uranium and Radium. They are helium nuclei, helium atoms which have lost their two orbital electrons; hence they have a net positive charge. They have velocity ranging from  $1.4 \times 10^9$  cm/sec to  $1.7 \times 10^9$  cm/sec . Alpha radiation may just penetrate the surface of the skin so are dangerous only if their origin is in direct contact with the body. They can be stopped by a sheet of paper.

$\beta$  – rays :

$\beta$ - rays are stream of high energy electrons similar to cathode rays. They are emitted with variable velocities, approaching to that of light during the process of radioactive decay of substances. They are much lighter than proton and when emitted with high velocities, ionises the substances in their path. They have more penetrating power than  $\alpha$  – rays and can be damage to tissue but less than X-rays and  $\gamma$ -rays. They can be stopped by 1 cm thin sheet of aluminium foil.

$\gamma$  – rays :

Gamma rays are emitted from atomic nucleus of radioactive element. They consists of electromagnetic

radiation of very short wave length and so have high energy. They have the same velocity as that of light and have much more penetrating power than X-rays and they can be stopped by a few cms of lead, concrete or water.

Neutrons :

Neutrons are uncharged particles contained in the nucleus of every atom heavier than hydrogen. they are uncommon in nature having radioactive decay half life of 11 minutes. They are obtained from neutron beam or the atomic disintegration of one of the radioactive isotopes. Major sources of neutrons is nuclear reactor and others are neutron generators and cyclotrons.

Ionising radiation and its effect on Man :

These radiations are potent sources of energy. Their toxicity is 100 million times more than cyanides. It has sufficient great energy to ionise atoms and molecules and have deleterious effect on living beings specially mankind. It can create biological disease like Leucopenia, Epilation, Sterility, Tumour production etc.

Natural Background Radiations :

The sources of these radiations are extraterrestrial and terrestrial. The extraterrestrial radiations comes from outer space and hence these are called Cosmic rays. The terrestrial radiations originates from the radioactive substances in the earth's crust. These radiation irradiates the human body from the outside.

Impact of radioactive radiation :

The radiation effect may be 1. Instantaneous 2. Prolonged 3. Delayed types Even it could be carried to future generation or production of defective embryos. All kinds of impact depends on two major factors : Doses of radiation and Duration of exposure.

The radiation effect is grouped at different cellular component level.

- Radiation effect on DNA:

This change or loss the base of DNA or break one or both chain of DNA molecule. There may be an immediate or delayed effect depending on the doses of exposure.

- Radiation effect on chromosomes :

In this effect there is a number of structural changes on chromosomes.

- Radiation effect on cellular level

In this effect there could be division delay or interphase death( die before division) or reproductive failure at cellular level.

- Tissue response to radiation :

Acute and chronic morphogenic effects on tissue, total body radiation syndrome, induction of carcinogenesis.

Radioactive fallouts :

RA fallouts are the input of radioactive dusts from the atmosphere on ground surface. The source of such dusts are usually nuclear bombs. Atomic bombs based on fission of uranium and plutonium release fission products that cause enormous effect on living system. Radioactive dust thus generated accumulate on living system through food chain and thereby cause serious damage to the life processes.

Radioactive waste :

From nuclear power plant RA waste generated – either as liquid or solid – should be treated properly otherwise they will contaminate the environment. RA waste disposal is a serious problem. No proper solution for the disposal of highly RA waste. It can not be destroyed. RA waste water could be treated through flocculation, precipitation, filtration and ion exchange processes. The solid waste could either be incinerated or disposed underground. The solid waste products are stored in special shielded tanks.

### III. CONCLUSION

Energy is necessary for mankind and living beings. Recently we are using oil, gas and coal as a major fuel sources which are non reproductive, costlier and non environment friendly. So we have to increase the use of renewable energy sources like solar, wind and water which are easily available, cheaper and pollution free. We have to adopt latest technology and design engines with more efficiency so that we can decrease less quantity of waste. For development it is needed to use RA sources for more energy production, human health and for other peaceful purposes. But protection against radiation hazards was not considered seriously as a major environment threat for human health. Global banning of nuclear weapons, safe disposal of nuclear plant wastes and proper dumping of RA material used in therapeutic purpose etc. are the major activities undertaken currently as a measure of radiation hazards protection. In addition , the workers handling for RA materials require to undertake proper protection during working hours at nuclear plant premises. The International Commission for Radiological Protection

works for the protection of workers and general public from radiation hazard.

According to ICRP's general guideline, workers should not be exposed radiation more than 5 rads a year and maximum exposure for general public should be one tenth of this. Nuclear plants are located , designed, constructed and operated to confirm very strict safety standards to ensure that risk associated with atomic energy is extremely low.

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