

Radiation Hazards and Global Responsibility

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I. Introduction

MANKIND, WITH all other living beings, have been living in an environment of radiation hazards from natural sources as well, such as radioactive minerals in rocks and soils, the cosmic rays from the open sky and the internal radioactivity derived from radioactive potassium and Carbon of the body. Terrestrial radiation shows considerable variation in degree throughout the world. For an instance in India on the coast of Travancore (Kerala), where fishermen live amidst exposure from the monazite sands which is believed to be considerably high. Similarly, natural radioactivity from various minerals increases significantly in some mines and in the water supplies of some areas. Even habitations in concrete and/or stones surrounding are more exposed to radiations than in the woodens or greens. Hence, option becomes obvious to keep surroundings with lot of vegetation around.

Intensities of radioactivity tend to be much lower at sea level whereas at high altitudes cosmic rays' radiation increases considerably high. The cosmic rays' radiation dose at 15,000 feet is more than five times as large as at sea level.

According to medical history, even in optimum state every human being receives a total of 10 to 12 roentgens of ionizing radiation over the whole body from mother nature itself. However, in course of the long history of

human beings on the earth, life became adapted to this level of radiation.

Any dose beyond the aforesaid level of radiation definitely needs our utmost attention to be careful and also to be consciously aware as how to either avoid or prevent ourselves from the risk of excessive dose of radiation.

We wish to evoke the conscience of the entire mankind to first make the whole world fully aware which could be possible only when the adequate awareness is aroused globally through such platforms. Of course wide spread knowledge through compulsory education and its prevention through legislation and legal compulsions are the call of time to-day. Any further delay, negligence or complacency on this front are going to inflict nuclear holocaust or distorted body and suffering to the future generations for which our children will never excuse us. Even mother nature will not forgive us and will not refrain from punishing us and our children for our selfish and mad act of today.

Before we resort to remedy or conclusion the humanity must be made aware of the following sources and causes of radiation hazards:

- (1) Natural sources -
 - (i) cosmic rays
 - (ii) soil/rocks containing radioactive elements.
 - (iii) Internal radioactive/ionizing compounds within the body prone to be aggravated on external dose.

	Sea Level	5,000' altitude	
(1) Cosmic Radiation	0.035	0.050	Roentgens/Yr
(2) Potassium in Body	0.020	0.020	"
(3) Thorium, Uranium and Radium in Granite	0.055	0.035	"
(4) Potassium in Granite	0.035	0.035	"

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- (2) Diagnostic radiography and fluoroscopy.
- (3) Roetgenographic surveys of large segments of the population for tuberculosis and cancer.
- (4) Dental radiography
- (5) Radiotherapy (X-Rays, radiation therapy etc.).
- (6) Industrial fluoroscopy and radiography
- (7) Medical and scientific uses of tracers (radioisotopes) in human beings.
- (8) Therapeutic (medicinal) uses of radioisotopes.
- (9) Occupational exposure of medical, scientific and industrial workers working with ionizing radiations.
- (10) Ionizing radiations from research and nuclear power sectors.
- (11) Experimental accelerators.
- (12) Luminous watches, television sets and extensive use of computer monitors etc.
- (13) Cosmic radiation at high attitudes in aircraft flights which normally flies at 25,000 to 40,000' heights.
- (14) Fallout from nuclear explosions, which are so sudden and devastating that the human population cannot cope-up with the situation to prevent itself. After the blasts or the accidents the effects are such, which do not leave any measure to prevent or rescue from the consequences.

Before emphasizing the consequences as a part of awareness drive it is necessary to look at the chart below which is of a compulsory or commonly encountered radiation dosages¹:

II. Consequences:

As a result of increasing use of X-rays and Radioisotopes in industries and hospitals and more and more nuclear power reactors all over the world the radioactive wastes are accumulat-

ing. Besides continuing nuclear weapons tests by nuclear technology possessing countries, the improper disposal and the fallout respectively are contaminating the vast areas of the earth making the life increasingly vulnerable to the risks of radiation hazards. At this rate there will be no escape whatsoever unless the global responsibility is felt by the entire mankind to day, otherwise it will be too late for any measure to be exercised. This is not an individual's or a national health problem, but it has international dimensions to be realised at once keeping in view with the increasing ozone hole making the life on earth more radiation prone. Careless discharge of various gases, fumes, chemicals in the open atmosphere and cutting forests for want of wood are warming up the global environment inflicting depletion of ozone layer and increasing cosmic radiation.

It is note worthy that any dose of radiation beyond human adapted level for natural radiation by virtue of thousands of years on the earth may not be considered safe or further adaptable. Adaptability is a gift of nature only to let the living beings survive against the unavoidable adversaries of nature but this state of adaptability is not achieved in one life-time of the living being.

All of us have got this present life for once to live sensibly for ourselves as well as for our children to let them live in a healthy atmosphere instead of radiation prone hostile one for which they would be cursing us for many generations to come.

According to the present state of knowledge derived from medical experiments, it appears that there is no level of radiation below which genetic damage would not occur and the damage, having once occurred, will be irreversible because that will even pass to many future generations. As per medical science even

Source	Dosage
(1) Cosmic and natural radiography	0.0003 r/d
(2) Back of luminous-dial watch	0.02 r/day
(3) Diagnostic X-rays, Chest fluoroscopy	0.05 r/day
(4) Diagnostic X-ray, Chest/pregnancy	9.00 r/film
(5) Dentalfilm (X-ray)	5.00 r/film
(6) X-ray shoe-fitting machine	10-15 r/fitting

1. C.L. Comar, *Radioisotopes in Biology and Agriculture* (1977).

the lowest doses of radiation are proportionally mutagenic (i.e. which brings change in the natural configuration of genes on the chromosomes) and all doses however distributed are cumulative or additive in effect. Lower cumulative dose consequently may be equal to the single higher exposure in its effect.

Geneticists see that increased uses of nuclear energy, X-rays and fluoroscopy and other sources of ionizing radiations from cosmos will progressively irradiate larger masses of population, which will lead to increased number of mutated genes in the total gene-pool. This may impair the vitality in the first few generations to a very low degree hardly noticeable and yet in the end may lead to a serious damage to man's genetic heritage beyond the comprehension of many ignorant and innocent people on the earth.

The other concern that is being expressed is the fear that if the frequency of mutation is increased the following ill-effects will be noticeable:

- (i) There will be increased number of cases of sterility, abortion and still births.
- (ii) The number of hereditary diseases such as malformations, blood diseases and mental diseases will increase and
- (iii) An increased number of recessive detrimental genes will accumulate in the total gene-pool and produce serious harm to the well-being of the future generations.

In the light of the present knowledge, the best estimate of the value of the doubling dose of Radiation is 30 - 80 r. It has already been noted that any increase in the radiation ex-

posure dosage, whether in one large dose or in one small fractioned ones, will increase the mutation rate and that all mutations normally are harmful.

Humanity should not forget or ignore that man's most precious trust is his hereditary material upon which depends the well-being and orderly development of future generations. Though at the same time some risk has to be accepted for the benefits expected from nuclear energy's use for peaceful purposes yet every possible step needs to be taken to minimise the dangers involved as stated above.

Apart from the above mentioned genetic damage through mutation and genetic aberrations there are many other hazards, inflicted due to chronic low level exposure, which may lead to leukaemia, cancer of skin and bone, shortening of life-span and premature ageing etc.

The extreme hazards of radiation are always more in case of ground nuclear Blasts i.e. nuclear bombs or the blast of nuclear reactors in war time.

In such conditions, the components of fallout must be conceived by all human beings, categorised as follows:

- a) Particles created by the fission process
- b) Particles having induced activity from the neutrons released during the explosion.
- c) The unfissioned, alpha-emitting material of the bomb's material itself
- d) High temperature which can melt even iron bars used in the houses.

Physical composition of fallout of radiation:

Radioisotopes	Radiation	Critical human organs
Strontium 89	Beta	Bone
Strontium 90	Beta	Bone
Yttrium 90	Beta	Bone
Yttrium 01	Beta	Bone
Zirconium 95	Beta, Gamma	
Niobium 95	Beta, Gamma	Bone
Technetium 99	Beta	Kidneys
Ruthenium 106	Beta, Gamma	Kidneys
Rhodium 106	Beta, Gamma	
Cesium 137	Beta	Muscle
Cerium 144	Beta	Bone
Praseodymium 144	Beta, Gamma	
Promethium 147	Beta	

Level of radiation:

Time after burst	Dose rate in r/hr
1 Hour	100
7 Hour	10
49 Hour (2 Days Approx)	1
2 Weeks	0.1
14 Weeks (3 Months approx.)	0.01

The effects of such Radiation impacts are absolutely devastating beyond repair depending upon the intensity of impact or exposure.

When humanity witnessed the agony of the people of Hiroshima and Nagasaki and within the same century is now experiencing the depletion of Ozone Layer and the global warming, which is going to challenge the life on the earth, how the Leaders, captains of War-fares and Industries, the United Nations and every human being can live in peace until the apprehension of the day of doom is not resolved to the satisfaction of all concerned. Of course, now the unconcerned traitors of humanity should not have a place on this Planet. It is now upto the sane to challenge the insane humans to come to their senses as the effects of 'dooms-day' will not be discriminatory in case of a Nuclear Holocaust.

The United States of America and the erstwhile USSR (now mainly represented by Russia) piled the maximum nuclear arsenals in a mad race for nuclear and military power, forgetting the truth that "if you dig the grave for others that will be for you as well."

To-day realising the grave magnitude of impact on humanity USA is trying NPT (Non-Proliferation Treaty) again in an imbalanced manner by asking many other non possessing countries to sign the NPT instead of asking a few ones like itself to dismantle it fully and then call it a day of 'No-Nuclear apprehension with a Global NPT drive' without discrimination.

This great responsibility rests with the present generation who are the custodians of the welfare of their descendants to see that the social load of hereditary disease is not increased for future generations as a result of man-made radiation. It is, therefore, imperative that every attempt is made to keep the population's Radiation exposure rate to the lowest level, ofcourse without any chance of

Nuclear Blast whatsoever.

With this intention, it is necessary to call upon the elites of this august gathering particularly the law makers and the protectors of law, the parliamentarians, the United Nations and the sane people at large to save this, the only known living planet, i.e., mother earth, by strict regulations and adherence to that, based on the following considerations, in my comprehension, yet, it could be much more if also conceived by other well wishers of humanity too:

- (1) Limitation of the use of all sources of radiation.
- (2) Radiations' dose levels to the individuals.
- (3) Radiations' dose levels to the population on wider scale.
- (4) Fallout from test explosions of nuclear weapons.
- (5) Recommendations regarding specific uses of radiations.
- (6) Limitation on gaseous and radioactive pollutants discharge causing global warming and Ozone layer depletion etc.
- (7) Restriction on depleting rain forests and replenishment through tree plantation as a global drive to save humanity and its environment.
- (8) Diffusing and dismantling of all nuclear arsenals by all the countries of the world without any exception because the exception is the root cause of distrust and would be the impediment towards achieving the goal of total elimination.
- (9) There must be a cut-off date i.e. not beyond this century to allow the nuclear arsenals to exist on mother earth.
- (10) Any single country who is opposed to this must be isolated and brought to its senses through global sanctions, opinions and pressure for the cause of humanity at large.

The aforesaid measures must be borne as Global responsibility against the radiation hazards or a nuclear holocaust.

