Al-Mustaqbal University
College of Science
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The Fourth Stage

Radiation Protection

LECTURE TEN

Environmental Radioactivity & Dose limits

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❖ Equivalent dose

Is a dose quantity representing the health effects of low levels of ionizing radiation on the human body which represents the probability of radiation-induced cancer and genetic damage? It is dependent on the radiation type and energy. In the SI system of units, the unit of measure is the Sievert (Sv).

❖ Benefits of knowing the equivalent dose

Dose limits help ensure that no person is exposed to an excessive amount of radiation in normal, planned situations. They are the strongest form of restriction on dose to an individual. Exceeding a dose limit is contrary to regulations in most countries.

Dose Limits Recommended by ICRP

Type of Dose Limit	Limit on Dose from Occupational Exposure	Limit on Dose from Public Exposure
Effective Dose	**20 mSv** per year with no single year exceeding **50 mSv** After a worker declares a pregnancy, the dose to the embryo/fetus should not exceed about **1 mSv** during the remainder of the pregnancy	**1 mSv** in a year. In special circumstances, a higher value could be allowed in a single year, provided that the average over 5 years does not exceed **1 mSv** per year

Type of Dose Limit	Limit on Dose from Occupational Exposure	Limit on Dose from Public Exposure
Equivalent Dose to the Hands and Feet	**500 mSv in a year**	-

To achieve protection from ionizing radiation, there are two important things that must be taken into account:-

One: Dose limits

Two: Fundamental principles of justification and optimization.

Where, Dose limits alone are not enough to ensure radiation protection. They function in combination with the fundamental principles of justification and optimization. Limits on effective dose, combined with optimization of protection, are designed to avoid a risk of stochastic effects that would be considered intolerable in a planned exposure situation.

General information

- Radiation is a fact of life. We live in a world in which radiation is naturally present everywhere. Many forms of "radiation" are encountered in the natural environment and are produced by modern technology. Most of them have the potential for both beneficial and harmful effects.
- Most public attention is given to the category of radiation known as "ionizing radiation." This radiation can disrupt atoms, creating positive ions and negative electrons, and cause biological harm. Ionizing radiation includes x-rays, gamma rays, alpha particles, beta particles, neutrons, and the varieties of cosmic rays.
- Radioactive materials occur naturally throughout the environment

Light and heat from nuclear reactions in the Sun are essential to our existence.

Sunlight, the most essential radiation of all, can be harmful in excessive amounts.

Our bodies contain radioactive materials such as carbon-14, potassium-40 and polonium-210 quite naturally.

Since the discovery of X rays and radioactivity more than 100 years ago, we have found ways of producing radiation and radioactive materials artificially. So a benefit from the use of radiation was established very early on, but equally some of the potential dangers of radiation became apparent in the doctors and surgeons who unwittingly overexposed themselves to X rays in the early 1900s.