



Islamic University / Najaf  
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# Radiation Protection 1

## Stage 2

### Lecture 7

Regulatory Dose and Risks

By

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## Regulatory Dose Limits

A single high-level radiation exposure (greater than 100 mSv) delivered to the whole body over a very short period of time may have potential health risks. Very high radiation doses can increase the occurrence of certain kinds of disease and possibly negative genetic effects. To protect the public and radiation workers from the potential effects of low level exposure (less than 100 mSv), following radiation safety is the default procedure adverse effects are possible with low level protracted exposure to radiation. Both public and occupational regulatory dose limits are set from before (Environmental Protection Agency) [EPA], Nuclear Regulatory Commission [NRC], and Department of Energy [DOE] to limit cancer risk. Other radiation dose limits are applied to limit other potential biological effects with workers. Effects produced by receiving high doses of radiation high a short period of time are known as threshold effects and can be easily observed a short period of time. These effects include radiation sickness and death, cataracts, sterility, loss of hair, reduced thyroid function and skin burns. The severity of these effects increases with the size of the dose.

There are other health effects of radiation that do not appear until years after an exposure. That any radiation exposure can increase a person's chances of having these effects, these are called non-threshold effects.

## **Sensitivity of Tissues and Organs to Radiation**

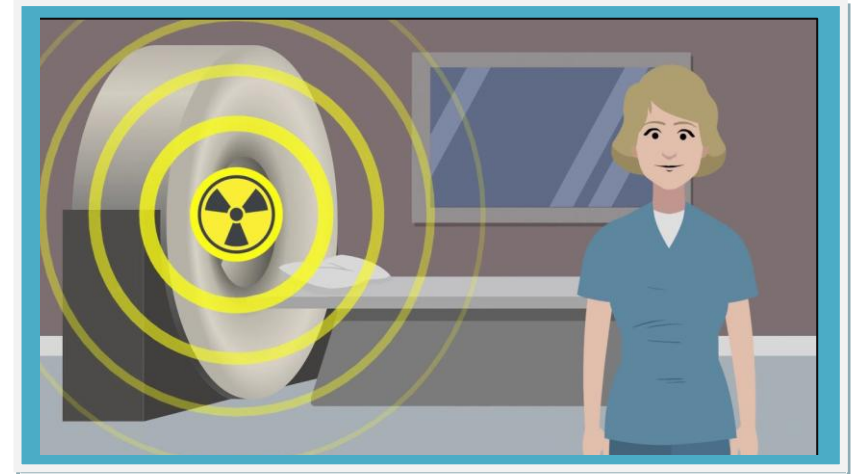
Radiation has been found to induce cancer in most body, tissues and organs. Different tissues and organs, however, show varying degrees of sensitivity. The tissues and organs, showing high sensitivity include bone marrow (leukemia), breasts, thyroid glands and lungs.

## **Factors Affecting Radiation Risks**

Risk can be defined in general as the probability or chance of injury, illness, or death resulting from radiation exposure. However, the perception of risk is affected by how the individual views its probability and its severity. Radiation can damage living tissue by changing cell structure and damaging DNA. The chance of developing cancer, not the seriousness of the cancer, increases as the radiation dose increases. Cancers caused by radiation do not appear until years after the radiation exposure. Exposing a developing embryo or fetus to radiation can increase the risk of birth defects. Although such levels of exposure rarely happen, a person who is exposed to a large amount of radiation all at one time could become sick or even die within hours or days. This level of exposure would be rare and can happen only in extreme situations, such as a serious nuclear accident or a nuclear attack. There are a number of factors that influence an individual's sensitivity to radiation. These factors include age, gender, other exposures and genetic factors.

## **Risks from Occupational Radiation Exposure**

The safety problems are related to ionizing radiation exposure from x-ray devices, particle accelerators, naturally occurring radionuclides and Industrial. All Protection Agency in its radiation protection guidance for occupational exposure urges that workers be clearly informed of the biological implications of radiation exposure.



## **Risks from Pregnant Patients and Staff**

A number of threshold effects can result from high doses, depending on the stage of development of the fetus. Fetal death is most likely in the first 2 weeks after conception. Cataracts, malformations, and mental and growth retardation can occur as a result of high radiation doses received 3 to 7 weeks after conception.

Exposures 8 to 15 weeks after conception may lead to mental retardation if the total dose is large. Also, a study of atomic bomb survivors in Japan showed that exposure between 8 and 15 weeks after conception

resulted in lower IQ scores in the exposed children. There is a requirement to ensure that the fetus of a pregnant employee is not exposed to a significant risk. Female staff should not be exposed to spasmodic high doses and on average should not receive more than about (1mSv) a month. The limit applies over the declared term of the pregnancy; that is, from the date that the employee informs her employer in writing that she is pregnant.

### **Protect the Public from Radiation Hazards**

Because of the potential for harm from exposure to radiation, radiation protection programs are designed to protect both workers and the general public, their descendants and the environment, while still allowing society to benefit from the many valuable uses of radiation. Current radiation protection systems are based on the following principles:

- 1-The benefit must outweigh the risk.
- 2- The amount of exposure must be limited.
- 3- All radiation exposures and releases to the environment must be kept as low as reasonably below regulatory limits.