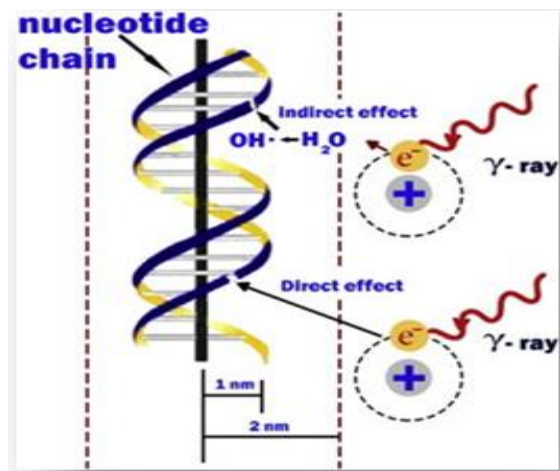


# Radiation Protection

## LECTURE FIVE

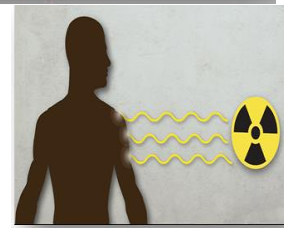
### Biological Effects of Ionizing Radiation



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## LECTURE FIVE: Biological Effect

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### ❖ Introduction

- ❖ What are the factors that increase biological effect of radiation?
- ❖ What are the ways radiation affects the cells of the body?
- ❖ Types of effects of ionizing radiation (depending on the duration).
- ❖ Symptoms associated with exposure to radiation.
- ❖ Type's exposure of ionizing radiation.

### ❖ Introduction

Man has known the harmful effect of radiation since the beginning of its discovery and before he knew the ways to prevent it, and these effects include noticing hair loss and redness of the skin as a result of exposure to X-rays and the infection of the discoverer of these rays with skin cancer. In addition to the high incidence of lung cancer among uranium miners as a result of inhaling the polluted air.

## LECTURE FIVE: Biological Effect

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❖ The biological effect of radiation depends on several factors, including the following:

- Type of radiation.
- The method of exposure to radiation, whether external or internal.
- Type of organ , depending on the following:
  - i) Sensitivity of the organ exposed to radiation.
  - ii) The ability of the organ to store radiation.

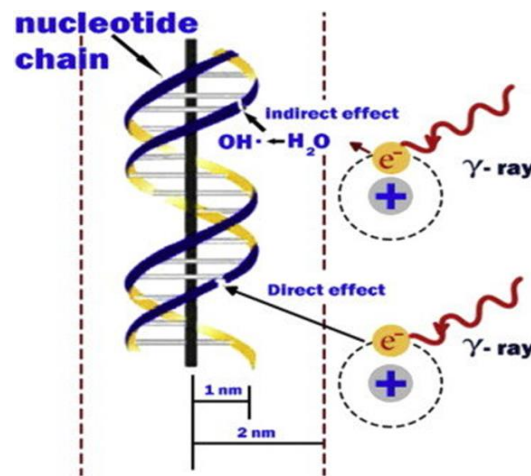
❖ Types of effects of ionizing radiation (Depending on the method of effect in the body)

### First: Direct Method

In the direct method, the **bonds between the atoms** that make up the molecules (living matter) are **broken** as a result of ionization, especially the nucleus of the cell, **causing its death or a genetic effect on it.**

### Second: In-Direct Method

As for the indirect effects, they result from the **decomposition of water**, which makes up 70-85% of the living body, and this in turn **produces toxic chemicals material** that affect the cell and neighboring cells.



*Direct and indirect effects of radiation on the human body*

### ❖ Types of effects of ionizing radiation (depending on the duration)

#### First: Deterministic effects

Deterministic effects are biological effects that appear on the body **directly and quickly** as a result of radiation exposure, where the symptoms will appear directly or later, but it is semi deterministic.

Based on the sensitivity of tissues and organs to radiation, symptoms **of the deterministic effects** of radiation exposure are divided into three categories **(classification)** ;

- Blood system symptoms
- Digestive system symptoms
- Nervous system symptoms

### **Second: Stochastic effects**

Biological effects that appear on the body **for a long time**, perhaps **after many years** as a results of radiation exposure.

One of the most important stochastic effects as a result of radiation exposure is the possibility of **cancer in the blood, skin, bones, lungs, and thyroid gland**.

❖ **The general symptoms that appear when the body is exposed to radiation are as follows;**

- Nausea
- Vomiting
- Fatigue
- High body temperature
- Change in the rate of blood components
- Changes to the skin, such as burns in cases of exposure severe and topical (burn spots).

**Bubble sheet questions**

- Q1-** The decomposition process of water inside human body and this in turn produces toxic chemicals material is -----
- A- deterministic effects      B- stochastic effects      C- direct method      D- in-direct method      E- acute exposure
- Q2-** ----- are biological effects that appear on the body directly and quickly as a results of radiation exposure.
- A- deterministic effects      B- stochastic effects      C- direct method      D- in-direct method      E- acute exposure
- Q3-** Based on the ----- to radiation, symptoms of the deterministic effects of radiation exposure are divided into three categories.
- A- decomposition of water      B- breaking bonds between atoms      C- sensitivity of tissues and organs      D- ability of the organ to store radiation      E- none of them
- Q4-** -----are biological effects that appear on the body for a long time, perhaps after many years as a results of radiation exposure.
- A- deterministic effects      B- stochastic effects      C- in-direct method      D- direct method      E- none of them