



Biological effect

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 them.

Radon gas and other cases that have been monitored by workers in the field of radiation and as a result of accidents and nuclear explosions and the damage that resulted from them.

The biological effect of radiation depends on several factors, including the type of radiation and the method of exposure to it, whether external or internal, the sensitivity of the organ exposed to radiation and its ability to store radioactive materials in case of internal exposure. The effect of radiation on the cells of the body is in two ways, a direct method and an indirect method. In the direct method, the bonds between the atoms that make up the molecules of living matter are broken as a result of ionization, especially the nucleus of the cell, causing its death or a genetic effect on it.

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

These biological effects can differ from some of them, some of which appear directly and quickly, and in this case it is called the **Deterministic effects.**

It has a certain threshold limit and some may appear after many years of exposure to radiation and **Stochastic effects.**



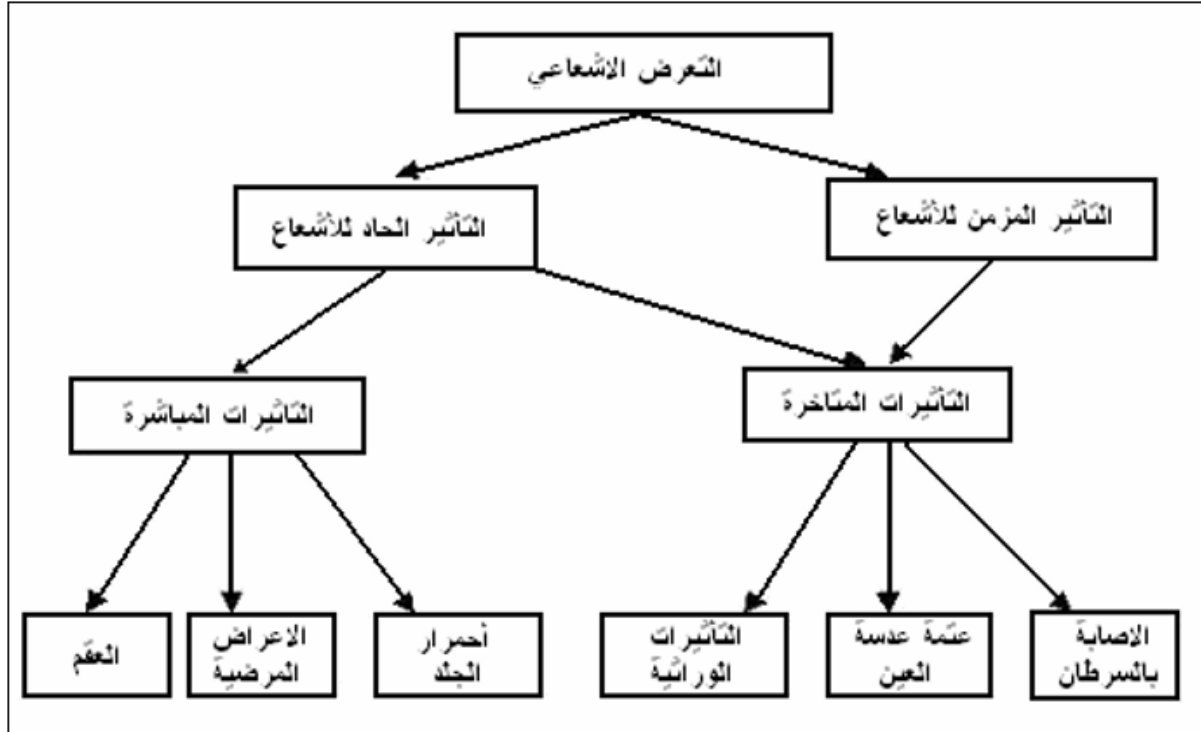
Hence, two main types of radiation exposure can be considered the **first exposure** to a high dose of radiation in a short time accidentally and this type is called acute exposure and this type of exposure in which biological effects appear directly or during a short period of time after exposure to a certain amount of radiation.

The other type of exposure is exposure to a low dose of radiation over a long period, and this is called continuous exposure or chronic exposure. In this case, the biological effects may not appear directly, and it may take several years after exposure, or it may appear in the following generations Dosage.

Deterministic effects

التأثيرات الحتمية

When human exposure to high dose of radiation, it will affect all members of the body and as these sensitive members differ from one type to another, in cases of radiation exposure, there are members of the body more affected by radiation from other organs and tissues, and thus the onset of symptoms associated with exposure radiological will appear on members Sensitivity based on the amount of radiation dose If the radiation dose is above the threshold for these tissues, the symptoms will appear immediately or in a delayed manner, but it is semi Deterministic, Conversely, symptoms either appear later or not appear and be probabilistic. So, based on the sensitivity of tissues and organs to radiation the symptoms were divided into three Categories The first is the symptoms of the blood system, the second is the symptoms of the digestive system, and the last is the symptoms of the nervous system with a common symptom of combining these three categories, such as nausea, vomiting, fatigue, high body temperature and changes in the blood, in addition to some symptoms of ill-body and sell changes to the skin such as burns in cases of exposure severe and topical.



Stochastic effects

Late effects of radiation may occur as a result of large doses in a short time or as a result of low exposure .For a long time, this may occur as a result of external exposure to radiation above the permitted limits, or in poor radiation conditions as well as internal exposure as a result of eating or inhaling radioactive isotopes that may settle in the body for long periods of time.

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

The onset of this disease may take years or more, as it is considered cancer

Blood is of importance as it is rare in normal cases. Leukemia and bone cancer that occur as a result of Exposure to radium can occur within two to four years after



exposure, and the risk of developing cancer after exposure cannot be ignored even until 30 years. One of the late effects is also a reduction in the ability of tissues to Regeneration and thus weakening the ability of tissues to renew themselves, and this is a disease in the tissues in itself that can affect .The bone, skin, lungs, kidneys, and alimentary canal.