

Gamma radiation in medicine

Gamma radiation (γ radiation) is an electromagnetic force with a wavelength less than approximately 10^{-12} to 10^{-13} m.

Gamma-ray theory

The topic of gamma-ray theory is divided into the following subtopics:

- Gamma radiation

Gamma radiation is a type of ionizing radiation that is produced during radioactive, nuclear, and subnuclear events together with alpha and beta radiation particles.

- Gamma radiation – mechanism of formation

Gamma-ray interactions with the shell

γ radiation acts on the absorbing substance indirectly, by means of the photoelectric effect, Compton scattering, and the formation of electron-positron pairs. Linear attenuation factor:

Photoelectric effect

- Photoelectric phenomenon

Compton effect

- Compton phenomenon

Formation of electron-positron pairs

- Electron-positron pairs

Effects of gamma radiation on the organism

High-energy gamma radiation is able to cause the release of electrons from electron shells when irradiating substances and is therefore ionizing radiation. The effect of gamma radiation on humans and other biological materials must therefore be assessed from the perspective of the effect of ionizing radiation in general. This article deals with the effect of ionizing radiation (and therefore also gamma radiation) on organisms:

- Effect of ionizing radiation on the organism

Protection against gamma radiation

Because γ radiation is very penetrating and has many negative effects on the human organism, it is necessary to protect oneself from it and thus limit its negative effects to a minimum. γ radiation is used in many medical procedures and in many technologies, but it is necessary to ensure that it has its effect where it is desired and does not have a negative effect where it is not desired. How we can protect ourselves from the negative effects of γ radiation is described in the following article:

- Shielding and protection from gamma radiation

The use of gamma radiation in medicine

Gamma radiation is used in medicine in a number of diagnostic and radiotherapeutic methods, which include:

- Scintigraphy

Leksell's Gamma Knife

The gamma knife represents a gentle, non-invasive method of treatment, the principle of which is a one-time targeted irradiation of the affected area without damaging the surrounding tissue.

- Gamma knife

Gamma camera

- Gamma camera

Positron emission tomography (PET)

The device displays different tissues of the human body based on their different metabolism. A small amount of radioactive substance is administered to the patient when the device detects the outgoing radiation. More information at:

- Positron Emission Tomography (PET)

Single photon emission computed tomography (SPECT)

The examination makes it possible to display changes in the function or metabolism of body structures (i.e. blood flow to the heart muscle or brain, inflammation, tumors, etc.) thanks to the capture of gamma radiation photons emanating from radiopharmaceuticals administered (most often intravenously) to the patient shortly before the examination with one to three gamma cameras. The result of the examination is a 3D visualization of the pathological focus. More information can be found by clicking on the following link.

- Single Photon Emission Computed Tomography (SPECT)

Other methods used in medicine

Capture Neutron Therapy

- Capture neutron therapy

Treatment with radionuclides

Radionuclides are an important part of modern medicine. At the same time, efficient production of these radionuclides is needed, as naturally occurring radionuclides are rare and expensive.

- Treatment with radionuclides

Radionuclide generator

Cobalt and cesium irradiators

- Cobalt and cesium irradiators

Links

Related articles

- Alpha radiation
- Beta radiation
- Ionizing radiation
- Radiation sickness