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Radiograph, Radiation Therapy and Cancer Treatment

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Abstract: ***A great thing is how the radiation and its damage to treatment and its development every day and benefit humanity from its applications is really great.***

Keywords: Radiograph, Radiation Therapy and Cancer Treatment

1. Introduction

I will talk about radiation, its types, history, risks, benefits, cancer treatment methods, radiation imaging equipment, radiation therapy equipment, radiation protection

1.0 What is Medical imaging?

Medical imaging of the human body requires a form of energy. In medical Imaging techniques used in radiology, the energy used to produce the image is able to penetrate tissues. Visible light, has limited penetration ability. The tissue is used in depth, mostly outside the medical radiology section. Photography. Visual images are used in skin diseases (skin imaging) and gastrointestinal tract and obstetrics (endoscopy), Pathology (light microscopy).definitely; all disciplines are used in direct visual observation medicine, which is also used as a phenomenon Light. In diagnostic radiology, the electromagnetic spectrum is outside visible light. The area is used for medical imaging, including mammography and calculus Magnetic Resonance Imaging (CT), Magnetic Resonance Imaging (MRI) and Gamma rays in nuclear medicine. Mechanical energy, in high-frequency form Ultrasound waves, used in ultrasound imaging [27]

Medical imaging

1.1 The Modalities of Medical imaging

Different types of medical images can be performed by changing the energies and types Acquisition technique used. Different ways of making images are indicated as modalities. Each method has its own applications in medicine.

- Fluoroscopy
- Mammography
- Computed Tomography
- Magnetic Resonance Imaging
- Ultrasound Imaging
- Doppler Ultrasound
- Nuclear Medicine Imaging
- Nuclear Medicine Planar Imaging
- Single Photon Emission Computed Tomography
- Positron Emission Tomography [27]

2. What is Radiation Therapy?

Radiation therapy is a high-energy X-ray therapy, where high levels of radiation work to kill cancer cells and prevent them from growing and dividing. Radiotherapy is used to treat cancer because cancer cells grow and divide more rapidly than most other normal cells around them.

It seems that normal cells also have a greater ability to fully recover from the radiation effects of cancer cells [0]

Radiation Therapy for Cancer

2.1 Radiation is delivered in one of two ways:

1. Brachytherapy

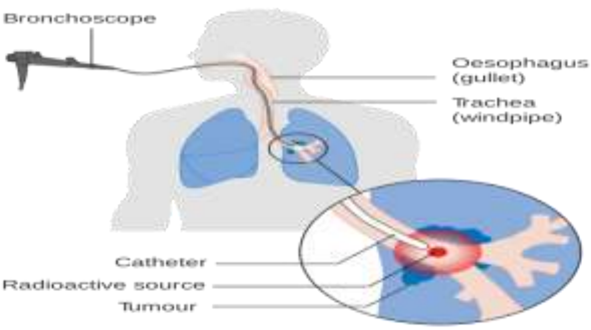
(Internal Radiation Therapy) Insert radioactive material directly into or near the tumor.

The radioactive material is then removed later or left in place.

Removable sources of radiation are inserted with small needles or thin tubes.

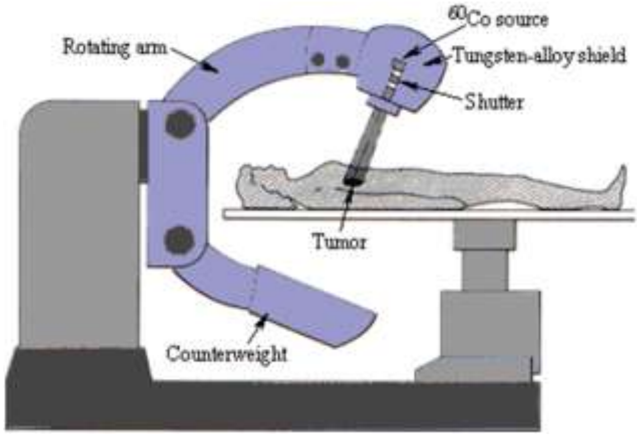
Sometimes the substance is left in the body (permanent muscle therapy). In this case, tiny beads containing radioactive material are inserted into the tumor.

The beads release radiation at the site of the tumor over a few days or weeks, and then no longer radioactive.



Brachytherapy

2. Remedial therapy
(External radiation therapy) uses the radiation beam directed to the tumor. Once the cancer area is identified, small tattoo ink is installed on the skin on the cancer area so that the radiation beam can focus on the same place for each treatment. It is necessary to focus radiation beam on cancer cells and to protect healthy tissue near radiation. External radiotherapy is usually done in multiple treatments, usually once daily for 5 to 6 days a week for several weeks. [0] external radiation therapy.



2.2 What are the objectives of radiation therapy?

2.2.1 Full recovery of the tumor

Some types of cancer can be cured with radiotherapy only or used as adjuvant therapy with surgery or chemotherapy. [11]

2.2.2 Control of cancer cells

By reducing the spread or proliferation or even growth of cancer cells in an attempt to control the tumor or treatment of side effects and here also shows what is known as telepathic therapy, which helps the patient to exercise his daily life better. [11]

2.3 What are the side effects of radiotherapy?

There is certainly no way to predict how your body will respond to radiotherapy. Some people will test the pathways of that. So some weeks.

Redness, inflammation or itching in the skin
Hair loss (only in the irradiated area)
Anemia
Nausea
Diarrhea
Stiffness in muscles or joints
Difficulty swallowing (if radiation therapy targets the mouth, head or chest area)
Lymphedema, [12]

3. What is radiation?

Radiation is energy traveling through space

Sunshine is one of the most familiar forms of radiation. It delivers light, heat and suntans.

While enjoying and depending on it, we control our exposure to it. Beyond ultraviolet radiation from the sun are higher-energy types of radiation which are used in medicine and which we all get in low doses from space, from the air, and from the earth and rocks.

Collectively we can refer to these kinds of radiation as ionising radiation. It can cause damage to matter, particularly living tissue.

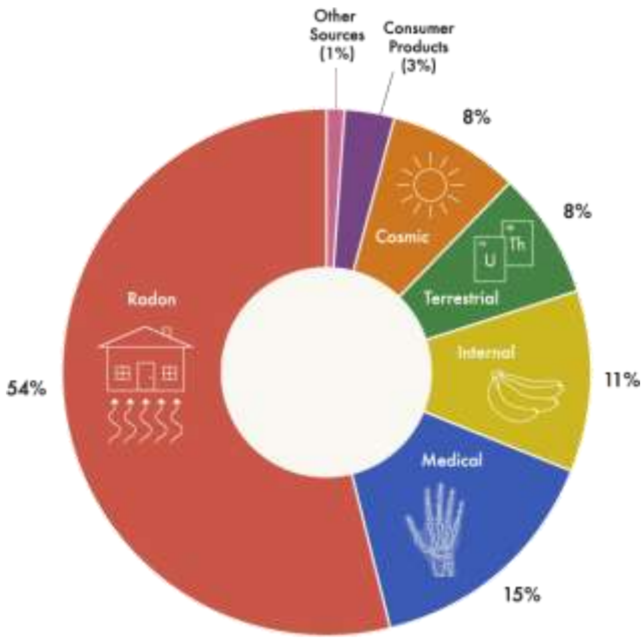
At high levels it is there dangerous, so it is necessary to control our exposure. While we cannot feel this radiation, it is closely detected and measured, and exposure can easily be monitored. Living things have evolved in an environment which has significant levels of ionising radiation. Furthermore, many people owe their lives and health to such radiation produced artificially

Medical and dental X-rays discern hidden problems.

Other kinds of ionizing radiation are used to diagnose ailments, and some people are treated with radiation to cure disease. Ionising radiation, such as occurs from uranium ores and nuclear wastes, is part of our human environment, and always has been so.

At high levels it is hazardous, but at low levels such as we all experience naturally, it is harmless. [9]

Considerable effort is devoted to ensuring that those working with nuclear power are not exposed to harmful levels of radiation from it. Standards for the general public are set about 20 times lower still well below the levels normally experienced by any of us from natural sources. [9]

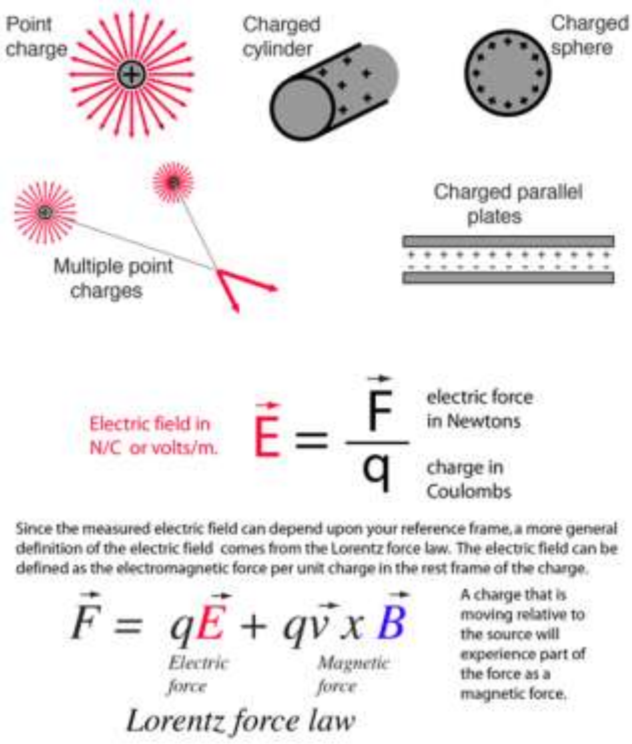


Background radiation

4. Electric field

4.1 The electric field is defined

As the wattage for each unit charge. The direction of the field is taken to be the direction of force that you will perform on a positive test charge. The electric field is externally from a positive charge and from a radial direction in a negative direction. [18]



4.2 History of the Electric field

Electrical phenomena were discovered in the era of ancient Greece, who observed the electrification of objects by means of dewalks, i.e., acquisition of electric charges. These objects were classified in two categories: positive charge and negative charge. An electric charge appears in the interplay between charged objects. Objects with identical charges are scrambling, and objects with different charges are attracted. At the beginning of the twentieth century, it was found that the charge has intermittent values, i.e., there is an indivisible charge called the primary charge of the charge and the charge of the electron e, and that the charge of any object q is equal to the correct replicates, i.e., q = ± Ne,

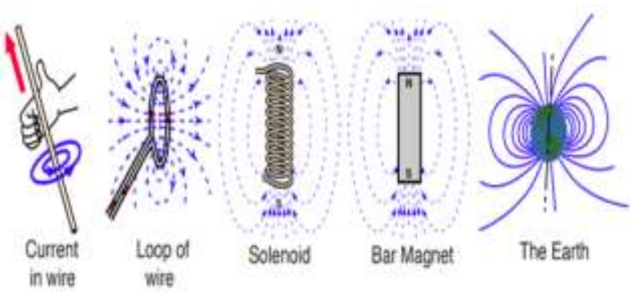
In the **1830**s, the English physicist Faraday introduced the concept of the electric field to illustrate the effects that electric charges can cause. Each static charge creates an electric field in the surrounding space that affects the other charges around it. It is said that at some point there is an electric field if an electrical force in a charge is affected at that point. The direction and direction of the electric field corresponds to Faraday a point of space with the direction of the force point in which the field affects a positive charge placed at that point. If the field at a point is produced from several point-to-point shipments, it is equal to the sum of the electric fields produced from each charge if found alone. This is called the principle of adhesion. [20]

4.3 characteristics of Electrical field

1-The domain lines do not intersect with each other.
2-They are perpendicular to the surface charge.
3-The field is strong when the lines are close together and are weak when the field lines move away from each other.
4-The number of field lines is directly proportional to the size of the shipment.
5-The electric field line starts from the positive charge and ends with the negative charge.
6-If the charge is one; it begins or ends at infinity.
7-The line curves are continuous in a free zone. [19]

5. Magnetic field

Magnetic fields are produced by electric currents, which can be microscopic currents in wires, or electron-microscopic currents in atomic orbits. Magnetic field B is defined in terms of force on the charge moving in the Lorentz Force Act. Magnetic field interaction with charging leads to many practical applications. Magnetic field sources are essentially bi-polar in nature and have a northern and southern magnetic pole. The SI unit of the magnetic field is Tesla, which can be seen from the magnetic part of Lorentz Fmagnetic = qvB (Newton x second) / Coulomb x meter. The smallest magnetic field unit is Gauss (1 Tesla = 10, 000 Gauss). [21]



Magnetic Field Sources

Both the electric field and the magnetic field can be defined by the Lorentz Force Act: [21]

$$\vec{F} = \underbrace{q\vec{E}}_{\text{Electric force}} + \underbrace{q\vec{v} \times \vec{B}}_{\text{Magnetic force}}$$

5.1 History of the Magnetic field

The ancient Greeks knew magnetism in 600 BC by discovering the magnetite magnet, which attracts iron, and proved that the iron itself is able to attract other iron pieces when it touches the metal, that is, magnetized. Then, in the 11th century, the Chinese used the magnet to manufacture the compass needle. The compass needle, which is able to rotate freely around a vertical axis, seeks to take the north-south magnetic direction because it occurs under the influence of the Earth's magnetic field, William Gilbert which arises in the interior of the Earth as a result of processes in its liquid nuclei. The general idea of the universe being a huge magnet appeared at William Gilbert during his work at the Queen Elizabeth English Palace in 1600. [22]

At the beginning of the nineteenth century 1820, Oersted observed the deviation of the magnetic needle located in the vicinity of a straight wire through which a continuous electric current passes, and concluded that electric currents generate magnetic fields in the surrounding space. Orstad's discovery was the first link between electrical and magnetic phenomena, in particular, the connection between the origin of magnetic fields and mobile charges. [22]Hans Christian Orsted

5.2 Characteristics of magnetic field.

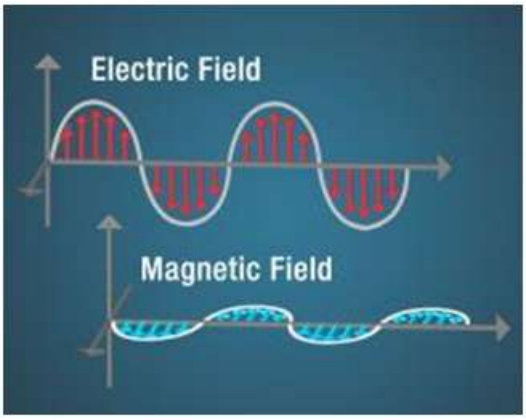
1. They have imaginary lines from the north to the south outside the magnet, and the opposite inside.
2. Magnetic force is at the poles, so it condenses at the poles and decreases in other areas.
3. Closed lines, because of the presence of the poles together, are unlike the electric current in which the electric charge is present [23]

5.3 Characteristics of magnetic power lines

1. Looking for the least resistance between the opposite magnetic poles. In one bar magnet as shown on the right, they attempt to form closed rings from pole to pole.
2. They never cross each other.
3. They all have the same power.
4. Density decreases (spreading) when moving from a higher permeability area to a less permeable area.
5. Density decreases with increasing distance from the poles.
6. They consider that they have a trend as if it were flowing, although no actual movement occurred.
7. Flowing from the South Pole to the North Pole inside an oblique pole and north to the South Pole in the air. **[24]**

6. What is Electromagnetic Wave?

Electricity can be static, like the energy that can make your hair stand on end. Magnetism can also be static, as it is in a refrigerator magnet. A changing magnetic field will induction a changing electric field and vice-versa-the two are linked. These changing fields form electromagnetic waves. Electromagnetic waves differ from mechanical waves in that they do not require a medium to propagate. This means that electromagnetic waves can travel not only through air and solid materials, but also through the vacuum of space.

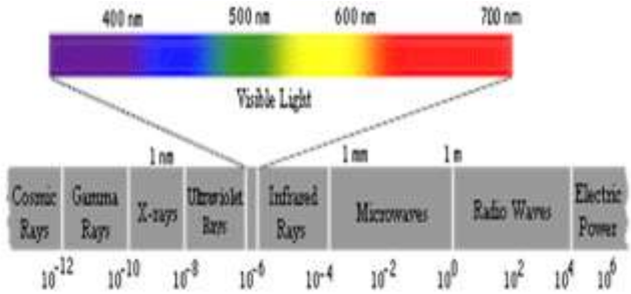


In the 1860's and 1870's, a Scottish scientist named James Clerk Maxwell developed a scientific theory to explain electromagnetic waves.

He noticed that electrical fields and magnetic fields can couple together to form electromagnetic waves. He summarized this relationship between electricity and magnetism into what are now referred to as "Maxwell's Equations."

Heinrich Hertz, a German physicist, applied Maxwell's theories to produce and receive radio waves. The radio frequency unit - a one-second cycle - is called Hertz, in honor of Heinrich Hertz.

His experience with radio waves solved two problems. First, he had proved in concrete, what Maxwell only theoretical - that the speed of radio waves equals the speed of light! This proved that radio waves form a light! Secondly, Hertz found how to make electrical and magnetic fields separate themselves from wires and go free as Maxwell waves - electromagnetic waves. [10].



7. X-Ray

X-rays form X-rays, a form of electromagnetic radiation.

Most x-rays have a wavelength ranging from 0.01 to 10 nm, which corresponds to frequencies in the 30-pHz range to 30 MHz (3 × 1016 Hz to 3 × 1019 Hz) and energies in the 100 volts range to 100 kV. The wavelengths of the X-rays are shorter than those of ultraviolet rays and usually longer than those of gamma rays. In many languages, X-rays are referred to with terms that mean radiation Röntgen, after the German scientist Wilhelm Röntgen, who is usually credited as its discoverer, whose name was X-radiation to denote an unknown type of radiation [1]

William Ronetgen

7.1 X-ray discovery

William Roentgen, an X-ray discoverer, threw an electronic beam into a glass tube with high electrical tension between the limbs.

This tube was discharged from the air and electrons released from the negative electrode to the positive electrode.

This tube is surrounded by a light colored sheet to protect the user from the emitted electromagnetic field.

A phosphoric screen was placed at the end of the tube. When the electronic beam collided with it, this screen began to glow.

When Richard Röntgen accidentally put his hand in the phosphoric tube, he saw a hand on the screen, the first x-ray operation [2]

Ringen printing hand of the first film Rontgen "medical" x-ray, his wife's hand, taken on December 22

7.2 X-ray production

1. A stream is passed through tungsten filaments and heated.
2. As the increased energy is heated enables the electrons to be released from the filament through thermal emissions.
3. Attract the electrons to the positively charged anode and hit the tungsten target at maximum energy determined by the potential of the tube (voltage).
4. When the electrons bomb the target they interact with through primeralong interactions and the characteristic reactions that convert the energy to heat (99%) and X-ray photons (1%).
5. The x-ray photons are released in a beam with a range of energies (x-ray spectrum) out of the window of the tube and form the basis for x-ray image formation. [3]

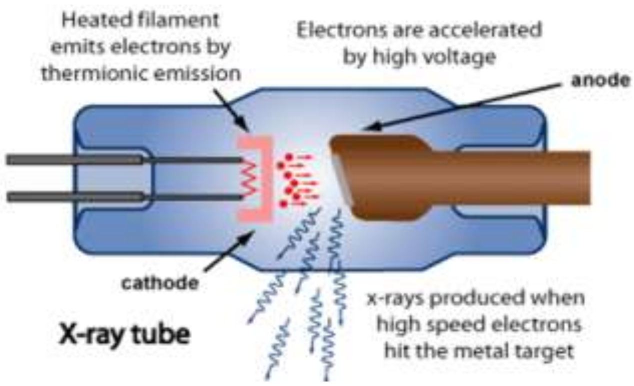


Illustration of x-ray production

7.3 Benefits of X-ray

There are many uses of radiation in medicine. The most famous is the use of x-rays to see if the bones are broken.

A wide range of X-rays is called the use of rays.

In the field of radiology, we find more specialized fields such as mammography, computerized tomography, and nuclear medicine (the specialty where radioactive materials are usually injected into the patient).

Another area of X-ray is called heart disease, where special X-rays of the heart are taken. [5]

The discovery of X-ray and CT (computed tomography scan) invention represents a major advance in medicine.

X-ray examinations are recognized as a valuable medical tool for a wide range of exams and procedures

They are used to:

Non-invasive and painless help to diagnose disease and monitor treatment.

Support the planning of medical and surgical treatment;

Direct medical personnel as they insert catheters, stents, or other organs within the body, treat tumors, or remove blood clots or other blockage [4].

7.4 X-ray risks

There are risks associated with using X-rays, which uses ionizing radiation to generate images from the body. Ionizing radiation is a form of radiation that has enough energy that can cause damage to DNA.

Risks arising from exposure to ionizing radiation include

1. A small increase in the probability that a person exposed to x-rays will develop **cancer** later in life.
2. Tissue effects such as cataracts, redness of the skin, and hair loss, which occur at relatively high levels of radiation exposure and are rare for many types of imaging exams.

For example, the typical use of CT scans or conventional radiography equipment should not lead to tissue effects, but the dose on the skin from some long and complicated interventional surgical procedures may, in some circumstances, be high enough to lead to such effects. [4]

Another risk of X-ray imaging is possible reactions associated with an intravenously injected contrast agent, or “dye”, that is sometimes used to improve visualization [4]

X-ray warning sign

8. Nuclear Radiation

8.1 Nuclear radiography

Nuclear radiography varies depending on the member to be examined by the doctor in each individual patient.
The main difference between different types of nuclear radiography lies in the type of pharmaceutical used and the way it is given to the patient.

During nuclear radiography, compounds containing radioactive substances are injected into the body. The body is then photographed by a special device that can show radioactive material.

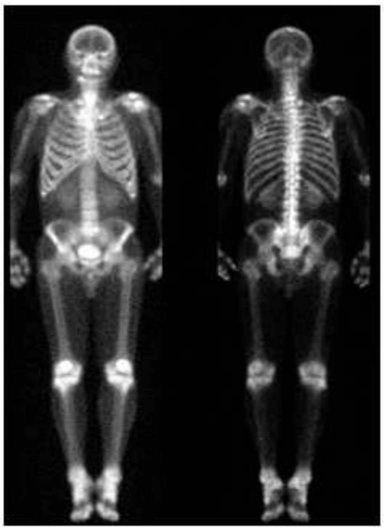
Radioactive materials are emitted from very weak rays that are captured by special devices.

After years of research it has been processed on the X-rays.

Use a method that tends to be concentrated in this gland. When using a nuclear heart, radiographs use compounds that the heart attracts. The same is true for bones.

It can benefit from nuclear radiography. Nuclear radiography can also be used to investigate bone cancer and fractures and bone fractures.

Nuclear radiography can also be used to pinpoint the exact location of the infection. [6]

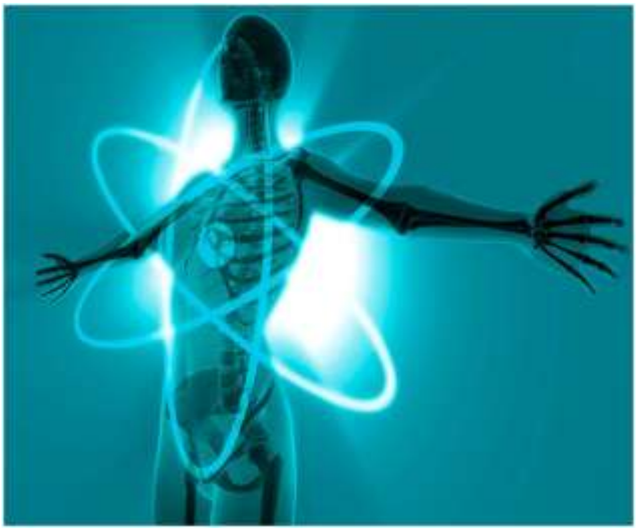


In nuclear radiography, the radioactive compound can be taken orally or injected into the blood. In some cases blood is taken from the patient and mixed with the compound and then injected again into the patient's body.

Nuclear radiography can be performed in one session or in multiple stages. The patient can return to take more pictures after a day or two. Nuclear radiography is usually performed in outpatient clinics.

The patient is expected to return home a few hours after the test.

Nuclear radiography ends after the radiologist has accepted the images taken and satisfied them. [6]



Imaginary image

8.2 What is General Nuclear Medicine?

Nuclear medicine is a branch of medical imaging that uses small amounts of radioactive material to diagnose and determine the severity of or treat a variety of diseases, including many types of cancers, heart disease, gastrointestinal, endocrine, neurological disorders and other abnormalities within the body. Because nuclear medicine procedures are able to pinpoint molecular activity within the body, they offer the potential to identify disease in its earliest stages as well as a patient's immediate response to therapeutic interventions [13]

Nuclear Medicine

8.3 Therapy by Nuclear medicine

Nuclear medicine also offers therapeutic procedures, such as radioactive iodine therapy (I-131), which uses small amounts of radioactive material to treat cancer and other medical conditions affecting the thyroid, as well as other cancer treatments and medical conditions.

Non-Hodgkin's lymphoma patients who do not respond to chemotherapy can undergo radiation therapy (RIT).

Radiation therapy (RIT) is a personalized treatment of cancer that combines radiotherapy and the ability to target immunotherapy, a treatment that simulates cellular activity in the body's immune system. [13]

8.4 What are some common uses of this procedure?

Physicians use radionuclide imaging procedures to visualize the structure and function of the organ, tissue, bone or system within the body.

8.4.1 Cancer

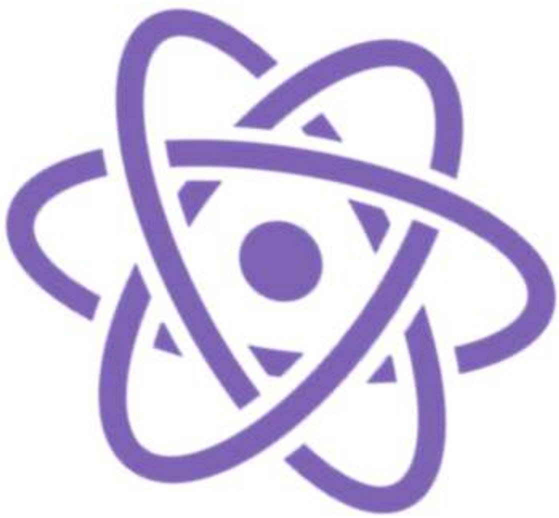
Stage cancer by determining the presence or spread of cancer in various parts of the body
Localize sentinel lymph nodes before surgery in patients with breast cancer or skin and soft tissue tumors.
Plan treatment
Evaluate response to therapy
Detect the recurrence of cancer
Detect rare tumors of the pancreas and adrenal glands

8.4.2 Heart

Visualize the flow of blood in the heart and function (such as scanning myocardial perfusion)
Detection of coronary artery disease and narrowing of the coronary artery
Evaluation of damage to the heart following a heart attack
Evaluate treatment options such as bypass heart surgery and angioplasty
Evaluation of results of awareness-raising measures
Detection of rejection of transplantation of the heart
Cardiac function evaluation before and after chemotherapy (MUGA) [13]

8.4.3 Other systems

Identify inflammation or abnormal function of gallbladder
Identification of intestinal bleeding
Evaluation of postoperative complications for gallbladder surgery
Evaluation of lymphatic edema
Evaluation of an unidentified fever
Locating the infection
Measure thyroid function to detect hyperthyroidism or hyperactivity
Help diagnose hyperthyroidism and blood cell disorders
Evaluation of hyperthyroidism
Evaluation of gastric emptying
Assess the flow of cerebrospinal fluid and potential spinal fluid leaks [13]



8.5. Benefits of Nuclear Medicine

Nuclear medicine tests provide unique information, including details about both the function and anatomy of the body, which are often unattainable using other imaging procedures.
For many diseases, nuclear medicine tests provide the most useful information to diagnose the disease or to identify appropriate treatment, if any.
Nuclear medicine is less expensive and may provide more accurate information than exploratory surgery**.**
Nuclear medicine provides the possibility of identifying the disease in its early stages, often before the onset of

symptoms or detecting abnormal conditions with other diagnostic tests.
By detecting whether lesions are benign or malignant, PET scans may eliminate the need for surgical biopsy or determine the best biopsy site.
PET scans may provide additional information used in planning radiotherapy. [13]

8.6 The risk of nuclear medicine

Because administered doses are small, diagnostic nuclear procedures result in very little exposure to the patient, which is acceptable for diagnostic tests. Thus, the radiation risk is very low compared to the potential benefits.
Nuclear medicine diagnostic procedures have been used for more than five decades, and there are no known long-term adverse effects from exposure to low doses.
The risk of treatment is always evaluated against the potential benefits of therapeutic procedures for nuclear medicine.
Radiation reactions may occur but are very rare and usually mild.

Radiotaracer injections can cause mild pain and redness should be quickly resolved.
Women should always tell their doctor or radiologist if there is any possibility of being pregnant or breastfeeding. [13]

8.7 History of Nuclear medicine

The history of nuclear medicine is rich with the contributions of talented scientists in various disciplines in physics, chemistry, engineering and medicine.

The multi-character nature of nuclear medicine makes it difficult for medical historians to determine the date of birth of nuclear medicine. Most likely this could be in a better position between the discovery of artificial radioactivity in 1934 and the production of radionuclides by the Oak Ridge National Laboratory for the use of related drugs, in 1946.

Many historians see the discovery of artificial isotopes produced artificially by Frederic Julio Curie and Irene Julio Curie in 1934 as a milestone in nuclear medicine.

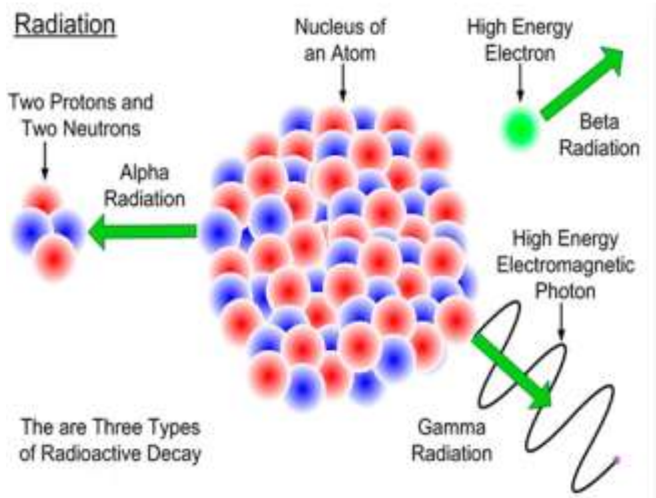
In February 1934, the production of the first synthetic product of radioactive material was reported in Nature magazine [7]

Frederic Julio Currie and Irene Julio Curie

8.8 Types of nuclear radiation

There are several types of particles or waves that may be released from a radioactive nucleus.

Alpha particles, beta particles, gamma rays and neutrons are the most common forms of ionizing radiation (ie, dangerous). [8]



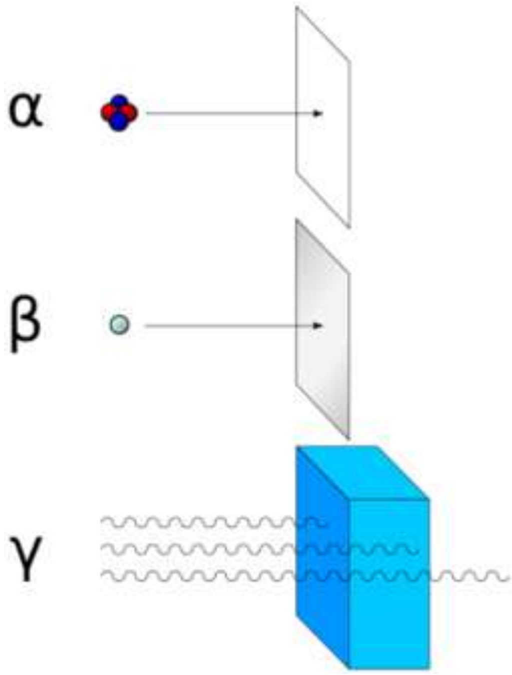
There are three types of Radioactive Decay

9. Alpha and beta particles, gamma rays

Comparison of the ability of alpha, beta and gamma rays to penetrate. Alpha particles (helium nuclei) can not penetrate a page of paper. Beta rays can be turned off, for example, using an aluminum plate.

Gamma rays have a high penetration potential, which is absorbed by penetrating dense material [14]

9.1 Alpha particles



These particles were named alpha because they were first discovered, consisting of 2 protons and 2 neutrons: helium nuclei. [8]

Alpha particles or alpha rays, although called rays, are helium nuclei, consisting of proton and neutrons, which combine in the nucleus with a large nuclear force, so that they are the most stable and cohesive elements. As they are 2 protons and 2 neutrons. These four are characterized by the largest loss in the mass when they are combined to form helium nuclei.

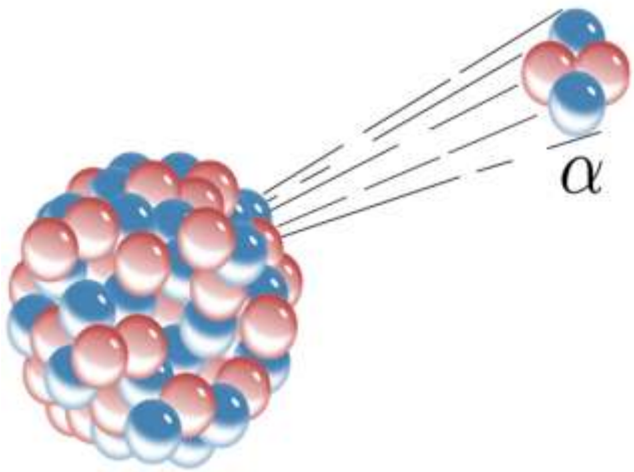
This is why an alpha particle produces a lot in nuclear reactions where it is not easy to dissect or disassemble. It has a positive electrical charge of 2 units for 2 protons, a weak penetration force with a weak capacity to reach its weight and low speed, and can be stopped with a piece of cardboard.

It has a great ability to ionize materials as the rate of ionization in substances that permeate alpha particles is directly proportional to the charge box of the particle.

Consisting of positively charged particles that are twice the charge of the protonbalt charge and twice the mass of the electron. Moving very fast 1/10 light speed up to 300, 000 km / sec. Due to their weight and low speed, they are not easily carried out through objects. When they fall on a plate covered with a layer of zinc sulphide, a noticeable flash occurs.

Alpha particles, the nucleus of helium-4 atoms, are massively formed in the sun and stars. Four hydrogen atoms merge into two nuclei of helium-4 nuclei. During that reaction, 2 protons become an alpha-neutronite. It is this supernatural interaction in the sun that gives the sun that tremendous energy that allows life to continue on Earth. Without helium being generated from hydrogen in the sun, there is no such tremendous energy that makes us alive.

Alpha rays or alpha particles (different from beta-gamma rays) were first identified by the detection of radioactivity of heavy elements above uranium and polonium. [14]



9.2 Alpha rays do not penetrate human skin!

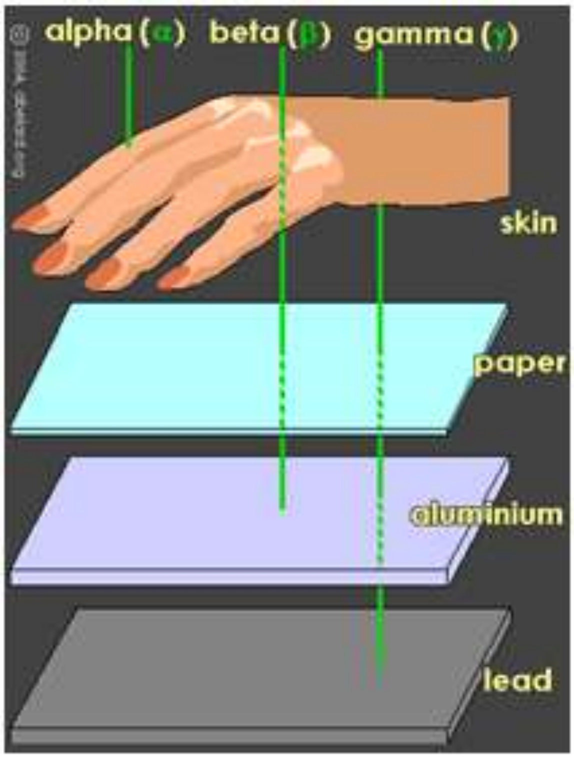
It has no penetrability of the skin. An alpha particle is a small mass of a substance consisting of two protons and two neutrons. Alpha particles do not go very far from their radioactive source.

They cannot penetrate into clothes, paper or even a layer of dead cells that normally protect the skin. Because alpha particles cannot penetrate the human skin they are not viewed as a "risk of external exposure".

This means that if alpha particles are outside the human body, it cannot harm them. However, when they enter the body they pose a health hazard if they are present in large enough quantities. For example, indoor radon exhausts where inhalation of alpha particles settles in lung tissue and radiates inward Alpha rays are streams of alpha particles.

The ionizing radiation in general (that is below the alpha rays) and the RNA and proteins directly, RNA and proteins can be direct, however often the damage that occurs in these free maggots, because they contribute to free radicals generation with water molecules can large doses Of radiation that works in doses, and advanced doses.

Damage to its components can lead to atrophy in tissues, hypoplasia and eventual cirrhosis. [15]



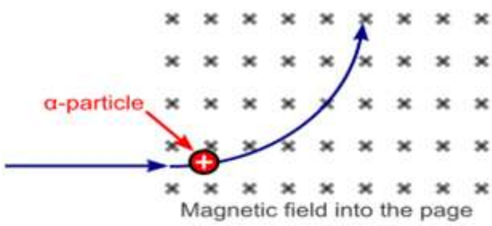
9.3 History of alpha particles

In 1899 and 1900, physicists **Ernest Rutherford** (two staff at McGill University in Montreal, Canada) and Paul Villard (working in Paris) separated radiation into three types: eventually **called alpha, beta and gamma** Before

"Rutherford", based on the penetration of objects and deviation by magnetic field. Alpha rays were defined by Rutherford as those that had the lowest penetration of normal objects.

Rutherford's work also included measurements of the mass of the alpha particles to its charge, leading to the hypothesis that the alpha particles were helium-charged ions (which later turned out to be the nucleus of bare helium). In 1907, Ernest Rutherford and Thomas Ruids finally proved that alpha particles are actually helium ions. To this end, they allowed alpha particles to penetrate a very thin glass wall into a vacuum tube, thereby capturing a large number of assumed helium ions inside the tube. They then caused an electric spark inside the tube, which gave the shower electrons that were captured by the ions to form neutral atoms of gas. A subsequent study of the resulting gas spectra showed that helium and alpha particles were actually helium ions.

Alpha particles naturally cause, but can have enough energy to engage in nuclear interaction, and their study has led to a very early knowledge of nuclear physics. Rutherford used alpha particles emitted from radium bromide to infer that the Thompson pudding pluming model was essentially flawed. In the Rutherford gold-chip experiment conducted by his students Hans Geiger and Ernst Marsden, a narrow package of alpha particles was created, Passes through very thin gold foil (a few hundred atoms). Alpha particles are detected by a zinc sulphide screen, which emits a light flicker on an alpha particle collision. Rutherford assumed that, assuming that the plum model of the atom was true, positively charged alpha particles would only slightly deviate, however, by the predicted positive charge. [17]



9.4 Particle Alpha Target Cancer

APS NEWS By Calla Cofield June 2014 (Vol. 23, No. 6)

α

In May 2013, the Food and Drug Administration (FDA) approved the first **cancer** treatment drug containing an alpha-emitting isotope. At the 2014 APS April Meeting, J. David Robertson, professor of chemistry at the University of Missouri, discussed a new technique that involves embedding alpha emitters inside a layered, gold-coated nanoparticle to make them safe for treatment for even more types of **cancer**. Endoradiotherapy is a form of internal radiation therapy in which a radioactive substance is ingested by or injected into the patient. Until last year, the radioactive isotopes used in endoradiotherapy were beta emitters (those that release electrons or positrons). While surgery is usually the best option for sizeable, isolated tumors, chemotherapy is utilized to destroy small groups of cancer cells (or “micrometastases”) in multiple locations.

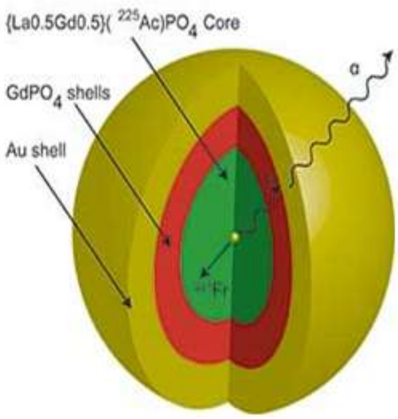


Photo courtesy of J. David Roberston/University of Missouri
Researchers are starting to expand the search for dark matter candidates

Endoradiotherapy drugs offer a targeted alternative to chemotherapy for attacking micrometastases. The drugs can be engineered to bind to receptors that are found on the cancer cells. When released nearby, beta particles do significant damage to cell DNA by ionizing other atoms and creating reactive chemical species in the cells.Alpha particles are more direct, delivering energy directly to the cell DNA and fatally disrupting chemical reactions. And while beta particles deliver a few hundred keV of energy over a few millimeters, alpha particles deliver a bigger punch of 5 MeV, but stop after a distance of a few microns. “That very large amount of energy deposited in short range…makes them more cytotoxic to the cell than beta emitters, ” said Robertson. “And it will allow you to get the same therapeutic effect with [about an order of magnitude] less radioactivity.” In May, the FDA approved Xofigo, previously known as Alpharadin, which contains the alpha emitter radium 223 chloride. Xofigo is currently being used to treat bone metastasis associated with prostate cancer. Robertson reports that a clinical trial of Alpharadin was so successful compared to placebo that the trial was stopped, so the control group could receive the drug as well. [16]

10. Beta Particle

Is an electron or positron of high velocity and energy and emitted from radioactive nuclei such as potassium-40. Beta-emitted particles are a form of ionized radiation also known as beta rays. The process of producing beta particles is called beta decomposition. A beta particle is represented by the Greek letter β (β). There are two types of beta decay: either β - which releases an electron, and β + which produces positron.

Beta particles have a weak ability to ionize the materials in their path, but their permeability to the materials is relatively weak, penetrating a 3 mm aluminum plate. Accelerators can accelerate particles, speeding up their particles to nearly the speed of light.

Beta particles are high-energy particles and the velocity of the electron or positron emitted from some radioactive nuclei such as high-potassium-40. A beta-decay is called beta-radiation and is called the Greek letter β. Beta-β decay has β-β +, where β-increases the number of electrons and β + increases bozons. [14]

10.1 Fermi theory of beta decay

In 1930, Wolfgang Baoli assumed the presence of neutrino to explain the continuous distribution of energy from electrons emitted in beta decay. Only with a third particle emission can momentum and energy be maintained. By 1934, Enrico Fermi had developed a beta-decomposition theory to include neutrino, which is supposed to provide neither mass nor mass.

Fermi treated with decomposition as a transitional period dependent on the strength of the link between the primary and final states, Fermi developed a relationship now referred to as the golden rule of Verme:

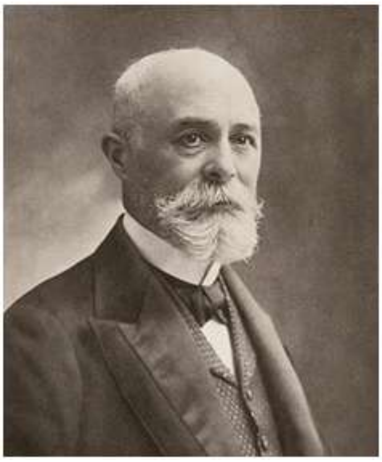
In direct principle, Fermi's golden rule states that the rate of transfer is proportional to the strength of the coupling between the initial and final cases calculated by the density of the final cases available to the system. But the nature of the reaction that led to beta dissolution was unknown at Fermi's time (weak interaction). It took about 20 years of work (Crane) to develop a detailed model that suited the notes. [25]

Enrico Fermi

10.2 β- Beta decay (electron emission)

The unstable nucleus, which contains a surplus of neutrons, can be corroded. The neutron is converted into a proton, an electron, and an antibiotic electron (the anti-neutrino particle): $\mathbf{n \rightarrow p + e^{-} + \nu_e}$

This process is mediated by weak interaction. The neutron turns into a proton through the emission of a virtual W^{-} boson. At the quarklevel, W^{-} The emission turns into a low quark to an upper quark, turning the neutron (one upper quark and two quarks down) into a proton (two upper quarks and one low quark). virtual W- Boson decomposes in the electron and anti-nutein. Beta decay usually occurs between fissile products derived from high-fission nuclear products produced in nuclear reactors. Neutron free radicals also degrade through this process. These processes contribute to large amounts of beta-based and electron-based nitrogen emissions from fission reactor fuel rods. These fuel rods also help control the reaction rate within the reactor. [26]



Henri Becquerel

10.3 β + Beta Decay (positron emission)

Unstable atomic nuclei containing excess protons can undergo β + decay, also called positron decay, where the proton is converted into a neutron, a positron and a neutron electron: $\mathbf{p \rightarrow n + e^{+} + \nu_e}$

Beta-plus decay can only happen inside nuclei when the absolute value of the binding energy of the daughter nucleus is greater than that of the parent nucleus, i.e., the daughter nucleus is a lower-energy state. [26]

10.4 History of beta

During his fluoridation experiment, Henri Becquerel inadvertently discovered that uranium had detected a photographic plate, wrapped in a black sheet, with some unknown radiation that could not be stopped like X-rays.

Ernst Rutherford continued these experiments and discovered two different types of radiation:

Alpha particles that did not appear on Becquerel plates because they were easily absorbed by black wrapping paper.

Beta particles that are penetrating 100 times more than alpha particles.

The results were published in 1899.

In 1900, Beckerle measured the mass-to-charge ratio (m / e) of beta particles using the J. J. Thomson method used to study cathode rays and electron identification. It was found that the e / m of the beta particle is the same for the Thomson electron, so it is suggested that the beta particle is actually an electron. [26]

Henri Becquerel

10.5 Beta particles and Health

The US Environmental Protection Agency explains that beta particles are used in the field of medical diagnosis, imaging and treatment of various cases. Radiation is the release of energy molecules and rays from atoms. There are many forms of radiation, with beta radiation being a rapid process that penetrates the human skin to break down chemical bonds and destroy certain living cells. Although effective in some medical treatments, such as cancer and pharmacological studies, significant effects of exposure to beta radiation can occur.. [27]

Beta particles are able to penetrate living matter to a certain extent and can alter the molecular structure of molecules exposed to this type of radiation. In many cases, these changes can be considered harmful to results that may be as severe as cancer or death. If the tapered molecule is DNA, it can cause spontaneous mutation.

Beta sources can be used in radiation therapy to kill **cancer** cells. [26]

10.5.1 Late effects

The Washington State Department of Health notes that exposure to beta radiation can delay health effects on the body. Any amount of exposure to radiation may lead to health conditions such as cancer or damage to the reproductive cells. As the effects of exposure to beta radiation are not immediate and there is no way to determine whether exposure leads to adverse effects, health problems can arise after months to years. EPA also explains that delayed effects occur from tissue damage by beta emission, and that increased exposure to beta radiation increases the risk of cancer. [27]

10.5.2 Acute diseases

Radiation disease occurs due to large doses of radiation during a short period of time. Mayo Clinic explains that beta particles can cause disease by exposure to high-dose radiation sources such as explosive devices, explosives or nuclear industry leaks. X-rays usually use low doses of radiation and do not usually cause radiation sickness. Signs of acute beta-radiation include nausea, vomiting and dizziness. The disease can occur within minutes to hours of exposure to a high dose.. [27]

10.5.3 Cellular mutations

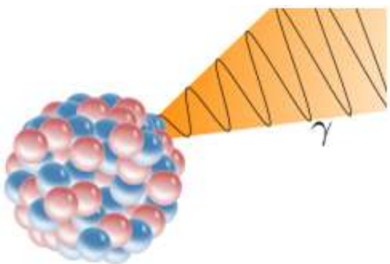
Direct exposure to beta particles through inhalation or ingestion is very dangerous. The EPA states that damage at the molecular level occurs from direct exposure to radiation, which causes changes in cell performance. This is especially important for women who are exposed to radiation during pregnancy, as the fetus is susceptible to cellular mutation and damage. Because of the weakness of the body during pregnancy, the care given to protect the patient from beta radiation during medical examinations using an X-ray machine is important, although X-ray devices use low doses of radiation, FDA notes. [27]

10.5.4 Additional effects.

Direct exposure to beta radiation can also cause severe burns to the skin, hair loss and weakness. The Washington State Department of Health also notes that weak immune system and nervous system damage occur from the delayed effects of beta radiation. Iodine 131, which is used to treat thyroid cases, is a beta emitter which is also a major concern, since it is also a source of thyroid node and cancer development. Continuing studies continue to explore the effects associated with Iodine-131 on thyroid growth. [27]

11. Gamma rays

Gamma rays are electromagnetic rays, the result of nuclear reactions that often occur in space. International treaties are therefore prohibited. It spreads in vacuum and air, and at a speed equal to the speed of light, has improved, greater ability to twilight of ultraviolet rays and x-rays and their wavelengths are very short, Its length ranges from 0.05 angstroms to 0.005 angstroms. And gamma rays that have a very harmful effect on living Earth. Without the atmosphere around the Earth, which absorbs and disperses these high wave frequencies and atoms, life will not exist on Earth. Because gamma rays have a very powerful ability to penetrate and penetrate objects.



Gamma rays are the most dangerous radiation in the electromagnetic field, because they possess the highest energy because of their high frequency.

As for their uses, they are used in the medical and industrial fields, but in very small quantities, where the radiation doses given to the patient are accurately

calculated to destroy the **cancer** cells, and restore the body's healthy cells after health. Recovery can track the path of biological processes in the body. As we know, the gravity of the thing lies in its strength, intense exposure to the sun, which therefore produces gamma rays, but its proportion in the sun is very low, and the risk of exposure to radiation of the sun lies in ultraviolet rays of high frequencies, which may lead to direct infection of skin cancer.
Physicists and practitioners in gamma-ray areas protect themselves from exposure to radiation. They use those rays and materials they produce from behind a 1 cm lead of lead. [23]

11.1 Who discovered gamma rays?

Paul Fierd, a French physicist working in Paris at the same time as Marie and Pierre Curie, credited him with discovering the rays of either g. In 1895, Roentgen discovered X-rays and shortly thereafter Beckerle discovered the radioactivity of uranium salts.

Paul Villard's main interest in chemistry was his study of cathode rays, x-rays, and radium rays. His experiments on radioactivity led to an unexpected discovery of the g rays in 1900. Villar acknowledged that they were different from X-rays because the g-rays either had a much greater penetration depth. It was discovered that it was emitted from radioactive materials and was not affected by electrical or magnetic fields. [24]

Paul Fierd

11.2 Characteristics of gamma rays

1. Gamma rays are high-energy photons (about 10 times the energy of visible photons)
2. The same photons as photons make up the visible range of the electromagnetic spectrum - light.
3. Photons do not contain a mass or an electrical charge, so they can not directly ionize matter or gamma rays.
4. In spite of this fact, g-rays either ionize matter through indirect ionization.
5. Although a large number of potential interactions are known, there are three main interaction mechanisms with the material.
   a. Photoelectric effect
   b. Compton scatter
   c. Pair production
6. Gamma rays pass at the speed of light and can travel thousands of meters in the air before they expend their energy.
7. Because gamma rays are highly penetrating, they must be protected by highly dense materials, such as lead or uranium.
8. The distinction between x-rays and g-rays is not as simple as this has changed in recent decades. According to the current definition, x-rays are emitted through electrons outside the nucleus, while gamma rays are emitted from the nucleus.
9. Gamma rays often accompany the emission of alpha and beta radiation. [25]

11.3 Dangers of gamma rays

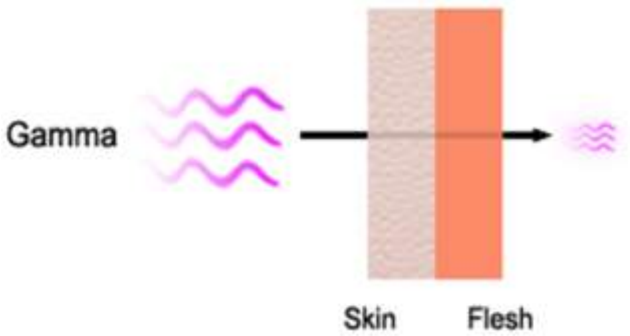
Gamma rays penetrate more deeply through the body than alpha or beta particles, all tissues and organs can be damaged by sources outside of the body. [29]

X-rays and gamma rays can cause a number of other problems besides cancer. What problems occur depends on the radiation dose, the timing of exposure, and the areas of the body you are exposed to. Exposure to high doses of radiation over a short period of time can cause radiation disease (sometimes called radiation poisoning or acute radiation syndrome) to death. Some symptoms of radiation include fainting, confusion, nausea, vomiting, diarrhea, hair loss, skin, mouth ulcers and bleeding. The atomic explosions in Hiroshima and Nagasaki have led to many cases of radiation sickness. Since then, some cases have resulted from accidents involving nuclear power plants, such as those in Chernobyl and Fukushima. Radiation doses such as those given in radiotherapy also cause side effects. Short-term side effects depend on the area being treated, but often involve changes in the skin (ranging from mild red to something like severe burns), nausea, vomiting, diarrhea, and low blood cells. There is also a risk of long-term side effects, which vary again depending on the area being treated.. For example, radiation in the head and neck area may cause problems in dry mouth and swallowing problems. It can weaken bone radiation, so that it is more likely to break later. Radiation to the bone marrow can lead to long-term problems with the number of blood cells and even a disease called anemia. Radiation can also lead to infertility (pregnancy or birth problems)

Low doses of radiation, such as imaging tests, are not known to cause short-term health problems. [28]

In many cases, some type of dense material is needed to reduce the hazard presented by gamma rays. Any material between the radiation source and the receptor is called shielding, because it absorbs some of the gamma ray energy before it can penetrate.. [29]

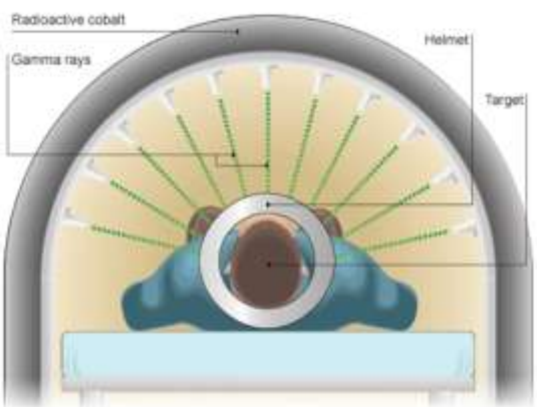
Large doses of gamma rays can damage or alter healthy cells, leading to growth of cancer cells or tumors. Gamma rays are the radiation associated primarily with explosions and nuclear accidents such as the Chernobyl reactor in Ukraine and the Fukushima nuclear power plant in Japan after the earthquake of 2011. Such incidents produce gamma-ray particles that pollute the environment for many years. [30]



11.4 Cancer treatment by gamma rays

In medicine nuclear radiation is used to sterilize hospital equipment, and help diagnose a range of medical conditions and treat **cancer** patients

High-energy gamma rays are used to kill cancer cells inside the body. Since gamma rays are powerful enough to kill cancer cells that kill healthy cells around the tumor, several weaker sources are used and arranged so that the gamma rays focus on either tumor. This focuses on gamma rays on cells that need to be killed. [31]



12. Radiographic imaging devices

King Fahad Hospital in Madinah was visited on March 5, 2018 and acquainted with some types of radiographic imaging equipment in Radiology Department.

12.1 General X-ray

X-ray imaging depends on the fact that tissues will absorb photons from the x-ray beam in relation to the density of electrons in tissues. This means that bones absorb more photons than fat-free tissue. Next, the number of photons passing through the object of interest will be detected either by film or by image detectors that direct the body's direct attenuation of photons into digital images. The resulting images are a two-dimensional projection of a three-dimensional structure. The disadvantages of X-ray techniques are ionizing radiation, which limits the usefulness of these techniques in longitudinal studies. [37]

12.2 X-rays are used to photograph the following

Examination of bone injuries, state diagnosis of fractures or fractures.

Examination of organs that must be filled with air in normal conditions, such as lungs when performing chest imaging (an act of presence in the lungs, light spots are formed indicating the presence of purulent fluid in the lungs).

Radiographic examination in order to know the size of the internal organs and their location for other members.
Check to diagnose the presence of holes in the teeth.

Other tests, such as Mammography, are performed to diagnose breast imaging, or to depict the abdominal area in order to test for some foreign objects that children may accidentally swallow. [38]

12.3 Protect workers on this device

The X-ray chamber is fully shielded with a thick layer of lead so that the radiation does not come out of the room and the specialist sets a lead shield for personal protection because it is in this room for a period of time.

12.2 CT scan

CT scans or axial tomographies are X-ray tests that produce cross-sectional cross-sectional images of the body using X-rays and the computer. CT scans are also referred to as computed tomography. CT was developed independently by a British engineer named Sir Godfrey Hounsfield and Dr. Alan Cormack. It has become the mainstay of medical diagnosis. In their work, Hounsfield and Cormack were awarded the **Nobel Prize in 1979.**

CT scans were first installed in 1974. Enhanced CT devices have significantly improved patient comfort because scanning can be done quickly. Improvements have led to high-resolution images, which help the doctor make the diagnosis. For example, CT scans can help doctors visualize small nodules or small tumors, which they can not see using simple X-ray rays. [39]

12.2.1CT examination to:

Quickly determine injuries in the lungs, heart, blood vessels, liver, spleen, kidney, intestines or other internal organs in trauma cases.

Manual biopsies and other procedures such as abscess drainage and minimally invasive tumor treatments.

Plan and evaluate the results of surgery, such as transplantation or gastric bypass.

Stage, planning and management of radiation treatments for tumors as well as monitoring the response to chemotherapy.
Measurement of bone mineral density to detect osteoporosis. [40]

12.2.2CT Scan Facts

1. CT scans allow the doctor to look inside the body just as one looks at a loaf of bread by cutting it.
2. CT has made a revolutionary development in medicine because it allows doctors to see diseases that can only be found in the past in surgery or autopsy.
3. If one looks at a standard x-ray or radiograph (such as chest X-ray), it looks as though it is seen across the body.
4. People often perform CT scans to conduct an additional assessment of abnormalities in another test, such as X-rays or ultrasound. [39]

12.3 Angiography and Fluoroscopy

12.3.1 Angiography

Or arteriography is a medical imaging technique used to visualize the interior, or cavity, of blood vessels and body organs, with particular interest in the arteries, veins and heart chambers. This is traditionally done by injecting a vaginal contrast factor into the blood vessels and imaging using X-ray-based techniques such as fluorescent endoscopy [41].

12.3.2 Uses of Angiography

1. Coronary angiography
2. Microangiography
3. Neuro-vascular angiography
4. Peripheral angiography [41]

12.3.3 Fluoroscopy

Fluoroscopy is a study of moving body structures - similar to X-ray film. The continuous x-ray beam is passed through the part of the body being examined. The package is sent to a TV-like monitor so that the body part and movement can be seen in detail. Fluoroscopy, as a imaging tool, allows doctors to look at many body systems, including skeletal, digestive, pulmonary, respiratory, and reproductive systems

Fluoroscopy can be performed to evaluate specific areas of the body, including bones, muscles, and joints, as well as solid organs, such as the heart, lung, and kidneys [42].

12.3.4 Fluoroscopy Uses

Fluoroscopy can be used for many purposes including the following:
Epidural Steroid Injections
Spine Procedures
Facet injections
Nerve Blocks
Joint Injections & Aspirations
Small joint (hand, wrist, foot, ankle)
Large joint (hip, shoulder, knee)
Ganglia (aspirations & injections)
Plantar fascia
Tendons
Bursa [43]

12.4 Ultrasound imaging

Ultrasonic imaging - also called ultrasound - and a short abbreviation with the symbol US - is one way of imaging the human body using high-frequency sound waves. This type of imaging does not guarantee the presence of any type of radiation. For this reason, sound waves are so safe that they are used to evaluate the condition of the fetus at different stages of pregnancy.
The common name among the public "acoustic rays" is an inaccurate label for the absence of radiation originally, and should be replaced by the name "sound waves" or more accurate "Ultrasonic waves"

This examination is not only for pregnant women. It is used to diagnose many diseases for men, women and children alike. But it is the best test to evaluate the stages of pregnancy because there is no radiation for what may cause harm to the fetus. [36]

12.4.1Ultrasound imaging uses

Abdominal ultrasound (to visualize abdominal tissues and organs)
Bone sonometry (to assess bone fragility)
Breast ultrasound (to visualize breast tissue)
Doppler fetal heart rate monitors (to listen to the fetal heart beat)
Doppler ultrasound (to visualize blood flow through a blood vessel, organs, or other structures)
Echocardiogram (to view the heart)
Fetal ultrasound (to view the fetus in pregnancy)
Ultrasound-guided biopsies (to collect a sample of tissue) [44]

13. Radiotherapy devices

Radiation therapy is provided either by external beams or by local radiation therapy, which involves placing radioactive elements in the form of small wires or seeds next to a malignant tumor. [26]

13.1 Three-Dimensional Conformal Radiation Therapy (3D-CRT)

3D-CRT is a type of external beam radiotherapy (EBRT), the most commonly used radiation therapy for mesothelioma.

New ways to provide radiotherapy to patients with mesothelioma make irradiation of the affected area more accurate. Bringing the radiation beam to the three-dimensional shape of the tumor reduces the risk of side effects

The treatment session for a 3D-CRT usually takes 15 to 30 minutes, although the first appointment may be longe

IMRT - an advanced form of CRT 3D - is more secure and more effective for pleural mesothelioma.

IMRT uses precise 3D targeting for 3D-CRT but also changes the speed and strength of radiation packets in specific areas [32]

13.1.1 3D-CRT Uses Imaging Scan Information

The two-dimensional images collected from the patient's CT scan, MRI, and PET scan are fed into a dome-shaped projector. This dome, connected to a computer, displays images as three-dimensional images.

These are not image images like those seen on other types of tests. Holograms are images that indicate characteristics such as tumor size, shape, location, and surrounding organs [32]

13.1.2

D-CRT Improves Control3

Radiation's the ideal role of radiation is still being assessed as part of the multimodal therapy for mesothelioma.

Part of this ongoing investigation is the experience of how to deliver high doses of radiation to the chest without damaging the natural tissue - especially within the lung.

Research shows that after additional pulmonary resection, 3D-CRT can be used to deliver high doses of radiation without serious risk.

However, the radiologist should be careful about exposing the remaining lung to radiation. [32]

13.1.3 Risks of 3D-CRT

The corresponding three-dimensional radiotherapy is a complex process that requires an experienced radiologist, especially when treating pleural mesothelioma patients.

Some patients treated with 3D-CRT experience no side effects. When adverse effects occur, they are generally associated with the area of the body being treated.

These side effects are usually not serious and disappear within four to six weeks after treatment. Medicines or changes in your diet can help control potential side effects [32]
.

13.1.4 Side effects of 3D-CRT

[32] Radiation, Pneumonitis and Esophagitis Mucositis

13.2 Intensity-Modulated Radiation Therapy (IMRT)

Intensive Radiation Therapy (IMRT) is a type of matching radiotherapy. The corresponding radiation therapy forms radiation rays to suit the cancer area.

Your IMRT can be on a standard radiotherapy device, called linear accelerator (LINAC)

LINAC contains a device called a multilayer interface. A multilayered machete consists of thin sheets of lead that can move independently.

Form shapes can accurately fit around the treatment area. The lead leaves can move as the device moves around the patient. This radiation beam makes the tumor spin as the machine.

This means that the tumor receives a very high dose and that nearby normal healthy cells receive a much lower dose.

Each radiotherapy beam is divided into several small beams whose intensity can vary. This allows for different doses of radiation to be given across the tumor.

IMRT can also create a U-shaped (concave) area on the edge of the radiotherapy field. This avoids high doses of radiation to structures that would otherwise be damaged by radiation therapy. So IMRT can reduce the risk of long-term side effects.

It is very useful in areas such as head and neck, for example to avoid spinal cord or salivary glands [33].

13.2.1 Which cancers IMRT can treat

Clinical trials IMRT has been tested in a number of cancers, including breast cancer, head and neck cancer.

Is a standard form of treatment for some types of cancer. But research is continuing, given the use of new treatments for other cancers.

Some trials are looking at improving your treatment with radiotherapy [33].

13.2.2 Possible side effects of IMRT

With intensive radiation therapy techniques, there is little natural tissue in the treatment area. So the risk of side effects is low.
Unfortunately, you can still get side effects. As with any external radiotherapy, side effects only affect the target portion of radiation therapy [33]

13.3 Stereotactic Body Radiation Therapy (SBRT)

Radiation Therapy (SBRT) is a treatment procedure similar to that of the central nervous system (CNS), but it deals with tumors outside the central nervous system. Radiation therapy means that a specially designed coordinate system is used [34]

13.3.1 How SBRT Works

Planning begins with diagnostic imaging to help locate the tumor and determine the area to be treated. This includes a three-dimensional imaging that determines the target area as it moves over time with the patient's breathing cycle. In the only gaseous part of the treatment, gold seeds, called fiducials, are sometimes grown in the tumor before taking pictures. Because fingerlings are visible in survey planning and at the time of treatment, doctors use it to make sure that the envelope with a high dose of radiation encapsulates the tumor accurately.

Oncologists work with radiologists to develop a radiation plan that ensures safe exposure to natural structures. Each treatment session lasts from 30 to 60 minutes and, unlike most interventions, the patient leaves every pain-free treatment or side effect. Treatments are not required in consecutive days, but treatment is completed in full within 10 days [34]

13.3.2 SBRT Uses

Candidates for lung cancer for SBRT are patients with small tumors - five centimeters or less - who are poor candidates for surgery because of the risk of functional disability. Patients whose tumors are centrally located or close to the airline or the heart are sometimes considered vulnerable candidates for SBRT due to high complication rates. Radiation oncologists at the University of California, California, treated these patients with slightly lower doses of radiation in combination with radio frequency excision. Both treatments offer two different forms of toxicity and provide good treatment for tumors with less risk in the patient's breathing function [34]

13.3.3 How SBRT Differs from Conventional Therapy

With conventional therapy, radiation is administered at relatively small doses over several weeks, with patients receiving daily treatments during that time. With SBRT, doctors can give a greater dose of common radiation over the course of much less treatments. SBRT showed significantly better results than traditional radiotherapy. While the two-year success rates for traditional treatments range from 30 to 40 per cent, SBRT rates range from 80 to 90 per cent - compared with eradication rates but with significantly lower risks. Despite the fact that SBRT offers a higher biological dose of radiation, patients have suffered fewer side effects, including radiological pneumonia. A mild fatigue for one week after treatment is the most common side effect [34]

13.4 Gamma knife

Is a real revolution in the brain and nerve world, a scientifically proven method of treatment for specific brain targets.

Is a package of rays directed finely to the area to be treated and to the accuracy of the knife sharp edge and hence came the name. This method has been used with more than

300, 000 patients with effective and safe technique, and is characterized by ease and painlessness [35]..

13.4.1 Benefits of Gamma knife

Increased safety: Due to the absence of surgical pieces in this type of treatment, and the lack of blood. This method is characterized by accurate accuracy in correcting radiation beams on the tumor area without exposing the healthy cells surrounding the tumor to any harm, this gives the patient a high degree of safety. In addition, the potential complications of such treatment are significantly lower than those of the same tumor.

High efficacy: The effectiveness and success of this treatment has been ascertained through three decades and hundreds of thousands of patients treated. Such treatment was done in cases where surgical intervention could not be performed

Rapid recovery: Gamma treatment Nayeft is expected to stay for one day, there is no need for intensive care, and return to his work only a short time to another

Economic efficiency: Because the patient stays in the hospital for one night only and without general anesthesia and without access to intensive care without the need for rehabilitation treatment and without absenteeism for long periods all this means reducing the loss of material and loss of working days and production of the patient [35].

It can also be used independently and individually when doctors are unable to use surgery due to the depth of the brain tumor or the age of the patient or the presence of chronic or acute diseases that prevent surgical or general anesthesia [35].

13.4.2 Cases where gamma knife is used

Malignant brain tumors.1
The tumor is spread to the brain.2
Glaucoma.3
Polyps.4
Cerebral vascular abnormalities.5
Facial irritation of the facial nerve.6
Treatment is still under study in the following cases:7
Parkinson's paralysis.8
Some mental illnesses.9
Epilepsy.10
High eye pressure (glaucoma) [35].11

14. Conclusion

A great thing is how the radiation and its damage to treatment and its development every day and benefit humanity from its applications is really great

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