Man-made radiation

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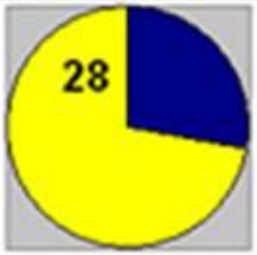
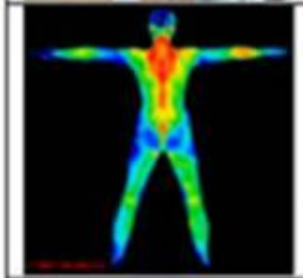
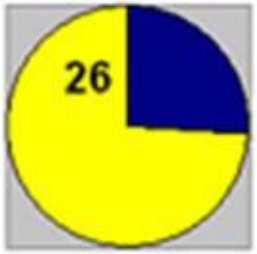
- Radioactivity - is the emission of nuclei of some elements of different particles, accompanied by the transfer of the nucleus in a different state and change its settings. Radioactivity was discovered phenomenon experienced by the Henri Becquerel in 1896 for uranium salts. Becquerel observed that uranium salt light-cured wrapped in many layers of photo paper with invisible penetrating radiation.

- Natural radiation sources
- The bulk of the entire population of Earth radiation received from natural radiation sources. Radiation - one of the oldest natural factors. Cosmic rays generally come to us from the depths of the universe.
- Earth radiation. The main radioactive isotopes found in rocks of the Earth - is potassium 40, rubidium-87 and members of the families of the two levels of radioactive radiation of the earth are not the same, because they depend on the concentration of radioactive isotopes in the specific area of the crust.

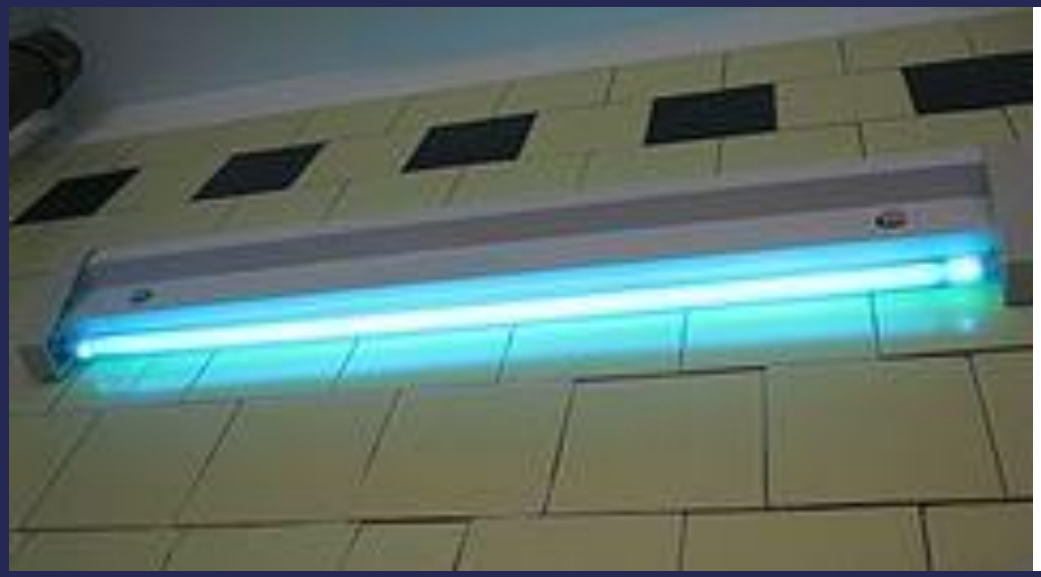
- Man-made sources of radiation
- Over the past few decades in the life of a person, in addition to natural includes artificial (or man-made) sources of radiation associated with the increasing use of nuclear technologies in medicine, industry, energy.
- Individual doses to different people from anthropogenic sources vary widely, although in most cases, insignificant. The main contribution to the radiation dose from anthropogenic sources make medical treatments and therapies related to the use of radiation.

Источники высокой энергии излучения

Естественные источники		Ежегодная доза мрен/год
	космическое излучение	
	Строительные материалы	
	Тело человека	
	Планета Земля	

Manmade Sources		Annual Dose (mrem/year)
	Medical (primarily from diagnostic X-rays)	
	Fallout from atomic bombs	
	Nuclear power production	
	Consumer products (mostly from color TV sets)	

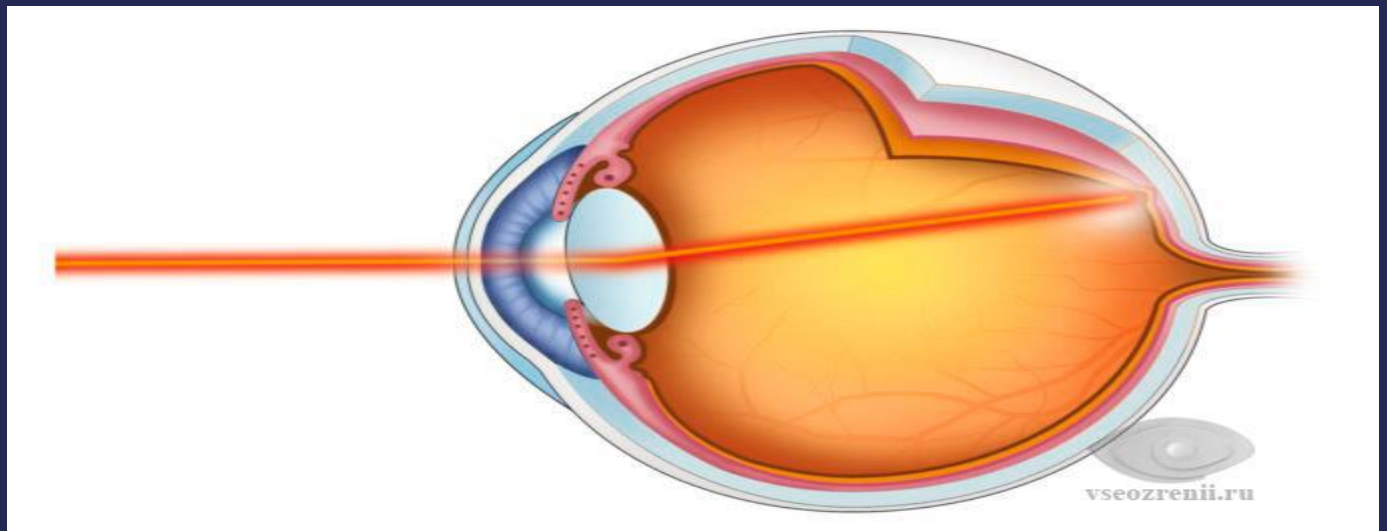
- Ultraviolet radiation - is electromagnetic radiation with frequencies greater than those of visible light, but less than X-rays.
- The sources of ultraviolet radiation are the sun and the so-called quartz lamp. This lamp comes arc in mercury vapor. Mercury arc light contains visible and UV rays. To use the resulting UV radiation lamp do not glass, which does not pass ultraviolet, and fused silica. Therefore, the lamp and called quartz.
- Ultraviolet rays have a strong effect on living organisms. Penetrating the tissue to a depth of 0.1 to 1 mm, UV rays cause a biochemical reaction are complicated, which is a consequence of human skin redness (erythema), which then passes, but leaves the light-brown pigmentation (tanning).



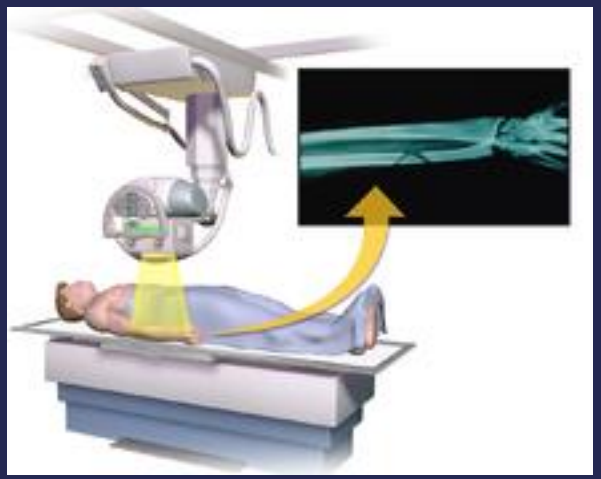
- There are three main types of biological effects of ultraviolet radiation:
- antirahit action, strengthening and tempering the body;
- erythematous, used for medicinal purposes;
- an antibacterial effect.
- In medicine, ultraviolet light is used for the sterilization of instruments and facilities.
- With the help of medical quartz lamp, the so-called "artificial mountain of the sun", doctors conduct an antibacterial irradiation of different areas of the skin, throat tonsils, nasal mucosa, mouth, throat and ear canal.

- However, when using ultraviolet radiation should not be forgotten that these rays are harmful to the eye. Ultraviolet rays are damaging to the retina. Large doses of ultraviolet radiation can cause burns of the retina, and temporary blindness. Therefore, by "kvartsevanie 'premises, summer vacation by the sea or in the mountains in winter, people should protect your eyes from excessive ultraviolet radiation.

- As a result, air cleaning with quartz lamp he enriched with ozone, which is in excess of maximum permissible concentration is deadly, as much oxidizes all animate and inanimate objects, so after Air cleaning with quartz lamp room should be ventilated. ordinary continuous operation mode quartz lamp is not more than 30 minutes, followed by a break of at least 15 minutes.
- Ozone is highly toxic due to the high oxidizing power. The effects of ozone on the body can lead to premature death, because it damages the respiratory tissues and forms insoluble form, leading to effects on atherosclerosis in the cholesterol in human blood.



- X-ray radiation - electromagnetic waves with frequencies greater than ultraviolet, but less than the gamma radiation.
- The source of X-rays in medicine is the X-ray tube. Passing through the human body, the X-rays are partially absorbed and the degree of absorption is proportional to the density of the tissue through which the rays.
- For example, if a person enlighten chest X-rays, the lungs filled with air, they will absorb little muscles - more bones and - even more. Thus, passing through the human thorax X-rays give light on the plate image, muscles and bones. And the image of the lungs of patients will be different from the image of healthy lungs presence blackout zones.
- With the help of X-rays, doctors can:
- diagnose the disease of internal organs;
- diagnose bone fractures and various joint diseases;
- detecting the presence of foreign bodies within the patient.
- X-rays are used in medicine for therapeutic purposes. Biological effects of X-rays is in violation of cell activity, especially rapidly proliferating cancer cells. This is based on the use of radiotherapy, and for controlling external cancers. Irradiated tumor narrow X-ray beam and kill cancer cells.



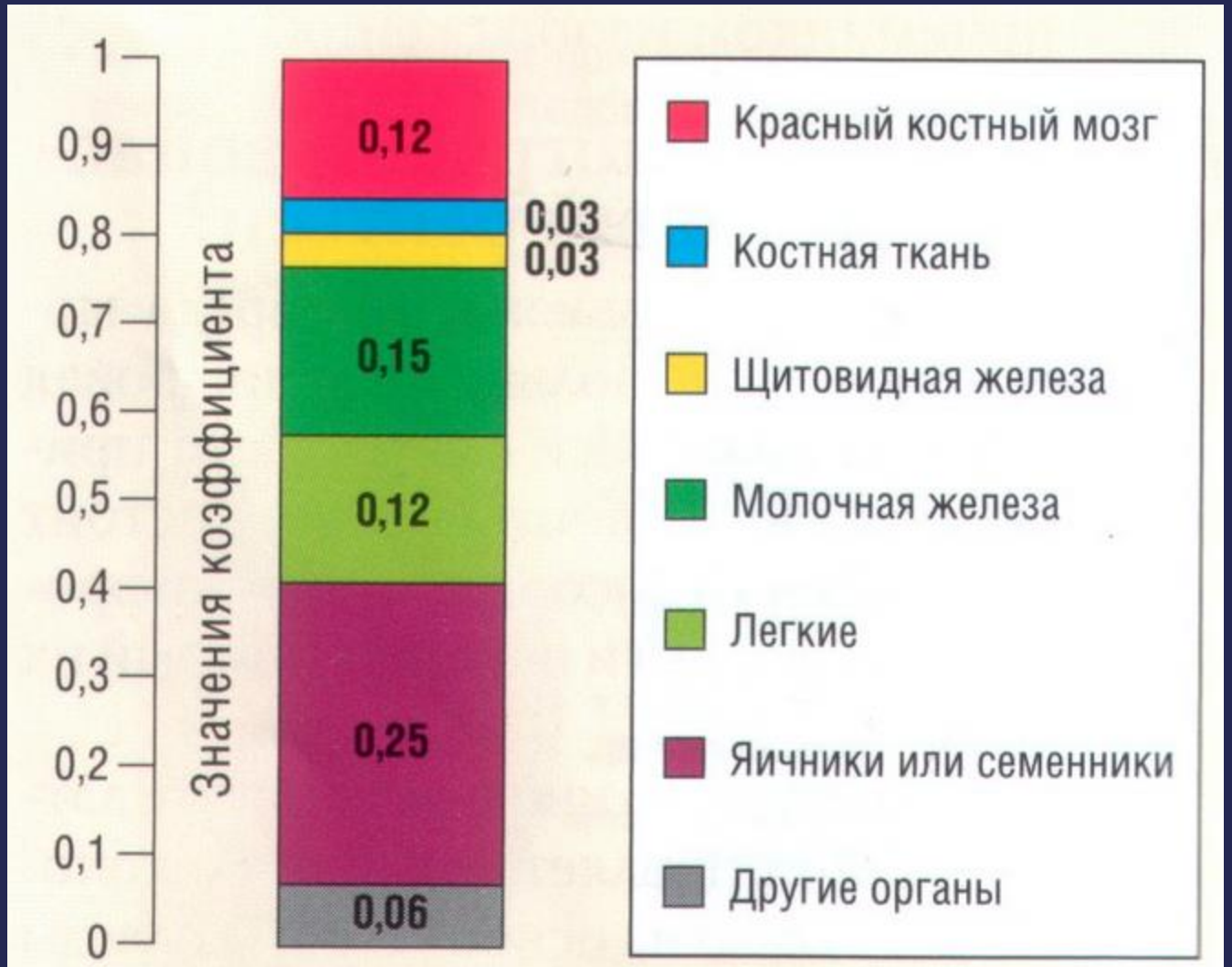


Рис. 1. Коэффициенты радиационного риска для разных органов человека при равномерном облучении (1,00 — организм в целом)

- Each organ and tissue differently affected by radiation. Therefore, the risk factors of radiation created. The higher the ratio the higher susceptibility of the tissue to radiation, and hence the risk of complications.

- By increasing the dose of radiation a person has:

- reversible changes in blood composition after minor quantities of radiation;
- Leukemia - a decrease in the number of white blood cells and change their structure, leading to the failure of the body's activities, vulnerability, decreased immunity;
- thrombocytopenia - decrease in platelets, blood cells responsible for clotting. This disease process can cause bleeding. Condition aggravated by damage to the vessel walls;
- hemolytic irreversible changes in the blood (hemoglobin and erythrocytes decay), by the impact of powerful radiation doses;
- erythropenia - reduction of erythrocytes (red blood cells), causing hypoxia process (oxygen starvation) in the tissues.
- Other pathologies:

- The malignant diseases;
- premature aging;
- damage to the lens of the eye with the development of cataracts.

- Equivalent absorbed dose is quantified amount of energy which is absorbed by the body, but it takes into account the biological response of body tissues to radiation. It is measured in sievert (Sv).
- 1 Sv = 100 rentgen. Human Death occurs within 1-2 months upon receipt of a single dose of 3-5 Sv, 10-20 days at a dose of about 10 Sv, from one to five days at a dose of 15 Sv. Individual annual rate of radiation for humans in a year about 10 microsieverts

- To evaluate the quantitative part of the radiation received per unit of time (hour, minute, second) use the concept - the dose rate measured in Sv / h (Sv-hour), mSv / h (microsieverts-h), R / h (roentgens-hour) mc / h (micro-roentgen-hour). Similarly - in minutes and seconds.

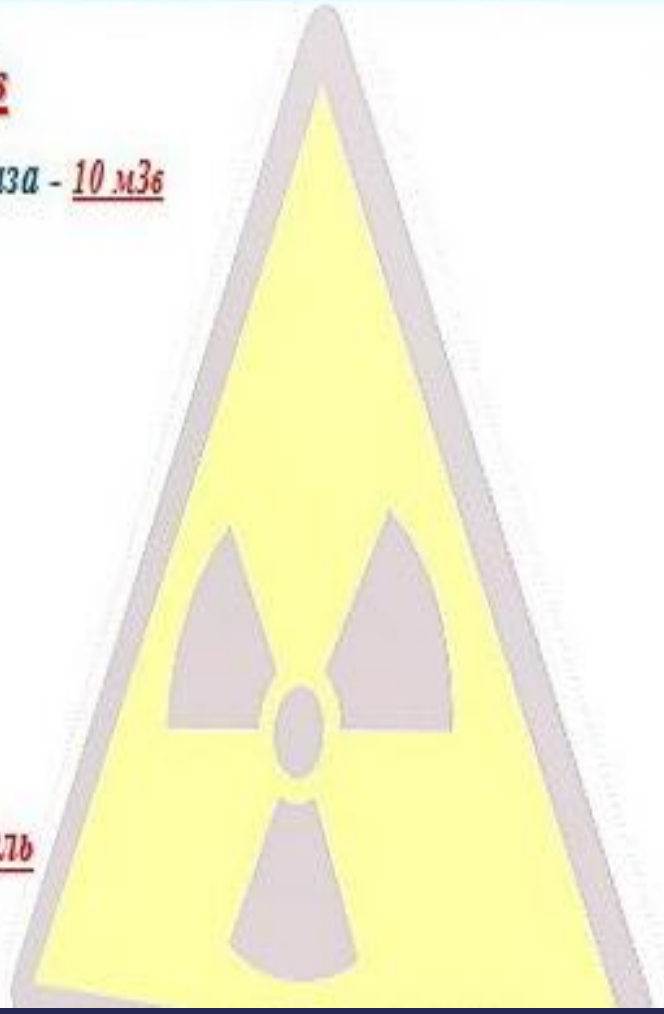
- All kinds of X-ray studies fit into the norms of safe radial load, measured in mSv (millisieverts).

- Doses for the treatment:
- digital X-ray: 0.03-0.06 mSv
- Foil photoroentgenography: 0.15-0.25 mSv
- X-rays of the chest cavity: 0.15-0.4 mSv .;
- Dental (tooth) digital radiography:. 0.015-0.03 mSv

Дозы облучения пациента при рентген исследовании :

1 мЗв = 1000 мкЗв

- Компьютерная томография органов брюшной полости и таза - 10 мЗв
- Компьютерная томография головы - 2 мЗв
- Компьютерная томография грудной клетки – 7 мЗв
- Рентген грудной клетки - 0,1 мЗв
- Рентгенография позвоночника - 1,5 мЗв
- Маммография - 0,4 мЗв
- Внутриротовой рентгенографии - 0,005 мЗв
- Среднегодовая природная доза облучения * - 2,2 мкЗв / житель
- Один час на самолете – 10 мкЗв



- http://medical-enc.ru
- https://drive.google.com
- Материалы международной научной конференции «Радиобиология: антропогенные излучения» (г. Гомель, 25–26 сентября 2014 г.)
- http://www.my-bt.ru
- http://www.medline.uz

Radionuclides decay

Radioactivity is the property of the individual nuclides, and spontaneous transition of nuclide from one element to the another nuclide perhaps only a few specific ways, but all these processes are regulated by the law of radioactive decay.

Radionuclides decay is the process is different from the destruction of our usual objects. Decay probability is independent of the time that nuclide exists, and moment of decay is impossible to predict.

Despite the fact that small part of the initial nuclei mass is converted into energy with each act radioactive decay, amount of energy released per unit mass of the preparation is large.

Scientists long time could not tie the concept of spontaneous decay with the fact that atoms are the simplest form of matter. Of course there is no contradiction, because the chemical reactions are not formed new kinds of atoms. But the radioactivity is radically different from the chemical reaction and synthesis of new elements in the nuclear reaction is inevitable.

For the convenience radiation assessment number of radionuclides expressed in terms of decay rate of this number, this value is called activity (*A*).

In radioecology have to deal with a mixture of radionuclides, it may be natural origin or a nuclear waste production mixture.

For decay processes responsible weak, strong and electromagnetic interactions. In nature commonly observed α-decay and β-transformation. ecay is a type of

is reduce α-decay is a type of radioactive decay in which an atomic nucleus emits an alpha particle (helium nucleus) and thereby transforms or 'decays' into an atom with a mass number that is reduced by four and an atomic number that is reduced by two.

β-decay is a type of radioactive decay in which a beta ray, which is either an energetic electron or positron and a respective antineutrino or neutrino are emitted from an atomic nucleus. γ-rays are short-wave electromagnetic radiation emitting nuclides in the excited state.

When analyzing nuclear reactions, should consider the following aspects:

1) conversion of one element into another;

2) unstable nucleus transition to a more stable.

- Red bone marrow
- Bone
- Thyroid
- Breast
- Lung
- ovaries
- testes