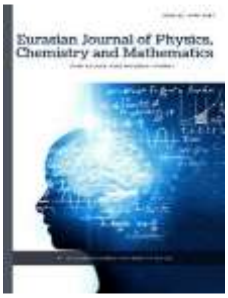

Mechanisms Of Ionizing Radiation Influences To Biological Cells

Professor A.S. Ziyadullaev	Academy Of Armed Forces Of The Republic Of Uzbekistan, E-mail: abdukaxxar.zavod @ mail.ru
Associate Professor F.T. Norgitov	Academy Of Armed Forces Of The Republic Of Uzbekistan, E-mail: abdukaxxar.zavod @ mail.ru
Associate Professor Z.Z. Shomuratov	Academy Of Armed Forces Of The Republic Of Uzbekistan, E-mail: abdukaxxar.zavod @ mail.ru

ABSTRACT

Article says about developing of atomic energetic, chain reaction processes in nuclear reactors, ways of maintaining of them, especially ionizing radiation influences to biological cells and biological changes.

It shows that as a result influences to biological cells in an organism happens biological changes.

Keywords: Nuclear reactor, chain reaction, nuclear fuel, ionizing radiation, biological influence, living cell.

The main fission isotopes currently used as nuclear fuel include uranium-235, plutonium-239, and uranium-233. Of these, practically only uranium-235 is found in nature. It is found in natural uranium, a mixture of three isotopes: uranium-238 (99.282%), uranium-235 (0.712%), and uranium-234 (0.006%). The isotopes plutonium-239 and uranium-233 are obtained industrially in nuclear reactors by irradiating uranium-238 and Thorium-232 with neutrons, respectively. From isotopes with boundary-property Fission, Uranium-238 is applied as nuclear fuel. For each cleavage substance, there is its own minimum weight at which a self-developing chain cleavage reaction can occur. This is called the critical weight. The critical weight of a fissile substance depends on its geometric shape, size, density, and the amount of impurities that are foreign, that is, those that can absorb neutrons without themselves undergoing fission, or slow them down (reducing their energy). The critical weight of round (sphere) uranium-235 is 40-60 kg at normal density and 95% purity, and plutonium -239 niki is 10-20 kg.

A nuclear device is a device, complex, equipment in which nuclear materials are used. Nuclear material is materials with fissile nuclear substances.Radiofaols are substances in any aggregate state that have radionuclides but do not penetrate nuclear materials. All ionizing Rays (α, β, γ, n and X-rays) have the property of excitation and ionization of atoms and molecules of the substances they pass through, hence the name ionizing radiation. Nuclear fuel is placed in Special Tubes in the form of a tablet with a diameter of 3 cm. A single tube is called a heat separator element (TVEL). TVELS are assembled into special equipment (TVS) from 900-16000 pieces. Protection: steel, concrete, polyethylene and water combinations depending on the reactor structure.

Radiation hazardous facilities include:

nuclear fuel cycle enterprises (YATS): uranium and radiochemistry industry, radiofaol waste processing and burial sites;

atomic stations: nuclear power plants (AES), nuclear thermal power centers (ATES), atomic heat supply devices (aste);

nuclear-powered facilities (YAEU): ships 'YAEU, space YAEU, troops' nuclear power plants (Vaes);

nuclear weapons and storage facilities.

Types of nuclear reactors.

Aqueous energy reactor (VKER).

Droplet-graphite energetic reactor (RBMK, EGP).

At the bottom of the nuclear reactors, Y -131 (8.04 sut.) are placed. It is an extremely dangerous raphiophaolic element for human health. Nuclear reactors are required to have an iodine pit for Operation.

The amount of Atomic Energy on Earth is huge and inexhaustible. The amount of uranium in the Earth's crust is about-2.5*1012 t. ga, equivalent to 2.5*1013 tons in the World Ocean. 1 kg of uranium-235-2.4 mln.kg sh.t. coal, 1 kg deuterium - 16 mln.kg can replace coal.

When using atomic energy, the following two problems arise:

• the need for the development of special areas of Mechanical Engineering.

* environmental problem.

But the fact that AES is much more environmentally friendly compared to thermal power plants (IES) is not without the problems of decontamination and thermal impurities of solid waste generated in them.

On October 19, 2018, Uzbek President Shavkat Mirziyoev and Russian President Vladimir Putin initiated the implementation of the first nuclear power plant (AES) construction project in the Republic of Uzbekistan. The first energobloc of AES in Uzbekistan is scheduled to be launched by the end of 2028. The construction of this AES was estimated at $ 11 millard.

AES is one of the best ways to get energy. However, due to a technical malfunction or if a disaster occurs through the fault of a person, a radioactive substance that is considered extremely dangerous to health can spread to the environment. In order to be prepared for such threats, to be able to eliminate them, it is necessary to master the foreign experience. Now more than 450 AES are working around the world, more than 50 are under construction. 10% of the total energy in the world corresponds to the contribution of Aess. The accent of developed countries has been adhering to security rules for many years, using this resource wisely.AES works on the basis of the reaction produced by the release of energy from the atomic nucleus. Mainly uranium or plutonium atoms are involved in this process. Uranium ore is ground into powder to use uranium at AES. Then the uranium powder is brought to the appearance of a metal "tablet" – it is pressed into small flasks and burned for several days at a temperature of 1500 degrees. It is these uranium tablets that settle in nuclear reactors. One reactor uses up to 10 million uranium tablets at a time.

Atomic nuclei emit a neutron from themselves. Neutrons produce new neutrons as well as particles with enormous kinetic energy. It is this energy that forms the basis of the activities of the atomic station. In an atomic reactor, the energy released during the reaction is converted into heat and transferred to the heat carrier (water). Then the temperature in the heat carrier passes through special heat exchangers to ordinary water in the second contour and boils it. The water vapor generated by boiling turns the turbine. The turbine drives an electricity generating generator. The way AES works is just like that of a thermal power plant. Only the difference between them is in how Steam is generated.

Does AES meet modern requirements?

The nuclear power plant, which is being built in cooperation with the Russian state corporation" Rosatom", consists of 2 energoblocks, each reactor has a capacity of 1.2 gigawatts (GVt). For the construction of AES in Uzbekistan, the reactor "3+SSER-1200" in the line of modern nuclear technologies of Russia was selected. These technologies are able to fully meet modern international safety standards and requirements. This AES is expected to be the only source of energy production not only in Uzbekistan, but also in Central Asia. 3.7 billion m3 of natural gas will be saved as a result of the activities of AES, which is planned to be launched in Uzbekistan by 2028. The volume of is gas, which is generated from burning natural gas and spreads to the environment, is reduced by 3 million tons per year. Even when exporting saved gas without processing, our country will have 550-600 million dollars of currency per year.

There is no need to build AES near a major fuel source. Bringing coal and gas to thermal electing stations would cost a great deal, while the uranium needed by AES could fit into a single truck. Importantly, the fuel used can be recycled and used as fuel again. There are two main problems with AES: water (the construction site of AES) and radioactive waste.

The first issue is radioactive waste. Alexander Renev," Rosatom "s chief technologist for reactors, touched on the issue of emissions, saying:" This is being worked on. After working on solid waste, they become bulky. Then we are obliged to return it to you, and this waste can be stored somewhere in Uzbekistan. This issue should be studied separately. Only for the storage of this waste will need a special infrastructure. It is necessary to make an additional contract for the construction of such an infrastructure."

The second issue is that, according to the technologist "Rosatom", the issue of cooling the water itself before is being considered. That is, additional energy is also used to cool the water. This factor significantly reduces the useful coefficient of work of AES.

Nuclear fission energy is based on the neutron fission of heavy nuclei, in which two nuclear fragments A_1 and A_2 and several neutrons (v) are separated. In nature, there is only one Isotope – U^{235}, which has the property of being able to divide under the action of neutrons of any energy:

$$U^{235} + n = A_1 + A_2 + v + E,$$

Where E = 200 MeV, the average value of v is v = 2.5, with V being a large 1, the chain gives rise to the possibility of the reaction being realized. Nuclear fission reactors serve this, and they are often called atomic reactors. 0.7% of natural uranium is ^{235}U, and 99.3% is ^{238}U, which mainly absorbs neutrons indivisibly. In natural-containing uranium, the chain is necessary to slow neutrons starting at en = 2 MeV (neutrons are born with this energy in fission), with a very small energy e_n = 1/40 ev to carry out the reaction; this energy corresponds to their thermal balancing with the medium, at which energy the probability of neutrons being absorbed by uranium-^{238} decreases sharply, their absorption by uranium-^{235} increases. For this purpose, in addition to uranium, a neutron decelerator is placed in the reactor – a substance with a small atomic weight and weak neutron absorption - light and heavy water, graphite, beryllium. It is a reactor that operates on slow (thermal) neutrons. A deceleration-free reactor-while a reactor operating on fast neutrons-can be a critical reactor only if it uses uranium enriched with 10% or more of the concentration of the isotope ^{235}U.

The reactor consists of a liquid or gaseous heat carrier that carries heat along with nuclear fuel and a retardant, structural materials, chain reaction adjuster organs (e.g., neutron absorber). Outside of the reactor itself, there are systems that protect against its radiation, circulate the heat transmitter, protect energy circulation and fuel from overloading, which are part of the nuclear power plant (AES). Using that the fission energy is e_n = 2 MeV, the reactor uses 1 g of uranium instead of about 3 T of conventional fuel to generate 1 MW/ day of thermal energy (fission) (MW/day is the energy released by 1 day from a million watt source).

During his visit to Uzbekistan on October 18-19, 2018, President of the Russian Federation V.V. Putin and President of the Republic of Uzbekistan Sh.M. mirziyoevs Started by. According to 2018, more than 470 nuclear reactors are currently being developed in 35 countries around the world. The electricity generated in them is 25% of the electricity generated worldwide (2,500 crore kWh).clock).

Biological effects of ionizing radiation. Ionizing Rays have a direct and indirect effect on the tissues of the body. As a result of direct, i.e. direct, exposure to tissues, their biomolecules ionize and excite, a theory well studied by Weiss (1944), also known as the radiolization theory of water. When ionizing rays pass through water, excited and ionized molecules are formed. The positively charged ion formed dissociates water, as a result of which the hydrogen ion and the hydroxyl radical buladi appear:

$$H_2+0 \rightarrow H^++OH$$

The released electrons are coupled with neutral water molecules to form negatively charged water

$$e^-+H_2O \rightarrow H_2O^-$$

and this dissociates to the hydroxyl ion and the free hydrogen atom due to its dissociation:

$$H_2O^- \rightarrow OH^-+H$$

Hydroxyl radicals and free hydrogen atoms form hydrogen ions and hydroxyl when irradiated with ionizing Rays:

$$OH^- \rightarrow OH+ e^-$$

$$H^++ e^- \rightarrow H$$

The free radicals formedOH and H have a high activity, so they cause the following reactions:

$$H+H \rightarrow H_2$$

$$\mathbf{H+OH \rightarrow H_2O}$$

$$OH+OH \rightarrow H_2O_2$$

$$\mathbf{OH+OH} \rightarrow H_2O\mathbf{+}\ O$$

Oxygen in the state of the dissolved molecule in water combines with atomar oxygen to form hydrogen peroxide (N_2O_2) and hydroperoxide (NO_2:

$$H +O_2 \rightarrow HO_2$$

$$2\ OH_2 \rightarrow H_2O_2+O_2$$

Thus, when tissues containing water are irradiated with ionizing Rays, chemically active radicals such as N, on, and NO_2 are formed, since NO_2 and on radicals have strong oxidizing properties, they cause the oxidation of organic substances to come to naught. The nature of the radiochemical changes that occur in the body is in many ways a link to the oxygen micdor in substrates exposed to radiation. If the partial pressure of oxygen is increased on these substrates, then there is an increase in radiation efficiency and an increase in resistance to radiation sensitivity when the partial pressure of oxygen is reduced.

Until now, the emergence of biochemical changes in the body as a result of the action of ionizing rays, and its development fullness has not been studied. Barron (1952) believes that radicals with oxidative properties formed in the body have sulfur in the body by combining with sulfhydryl groups (S-N) of the main enzymes (adenosintriphosphatase, succinoxidase, hexokinase, oxidase, carboxylase, cholinesterase, etc.) to reduce their activity, resulting in the development of the first initial biochemical changes in the body.

B.N.According to Tarusov (1954), radiation - induced perekis radicals undergo an oxidative reaction with lipids in the body to form free fatty acids, which lead to the development of biochemical outbreaks as acids have toxic properties.

When exposed to direct radiation, chromosomes are damaged, due to the indirect effects of radiation, tissues from water radiolysis products are damaged. The sensitivity of cells and tissues to radiation will depend on their activity. French scientists Bergone and Tribondo (1906) believe that the more active mitotic cleavage of cells increases, the higher their sensitivity to radiation. Accordingly, radiation-sensitive tissues can be arranged as follows: lymphoid and myeloid tissues, sex gland epithelium, intestinal glands, cutaneous epithelium, eye cavity, endothelium, serous floors, parenchymatous organs, muscle, Thoracic, bone, connective tissue, nerve tissue.

Conclusion.

The way out of the energy crisis is necessary, first of all, to switch to the use of new energy sources instead of activating organic fuels, and the role of AES in this is high.Under the influence of ionizing Rays, pathomorphological changes occur in the body, these changes can be divided into four groups in the schema style: the appearance of dystrophic changes in various organs and tissues; hemorrhagic manifestations; emptying of blood-producing organs; infectious complications.

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