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Method of Assessment of Gamma (G) -Radiation Effects In Rats

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Annotation: The widespread use of nuclear energy for peaceful purposes in life, including the use of radiation in the treatment of many diseases, requires the study of the effects of light on the body. It is also noted that the liver is one of the organs sensitive to direct radiation exposure in the use of radiotherapy in tumors of the digestive system.

Keywords: g-radiation, g-quantum, tumor, decapitation, radiation, enzyme, buffer system, amylase, lipase.

In studies, the standard method was used to study radiation effects of γ-radiation in rats [1; 3-21-b.]. In the experiments, white, non-breeding rats were irradiated using a Luch device (cobalt radioactive isotope) based on γ-quantum. In this case, the size of the irradiating surface is 20 × 20 cm, and the value of the focal length of irradiation is 75 cm. The irradiation dose value of the experimental animals under the influence of g-quantum was calculated to be 0.85–0.86 Gray / min. The value of the radiation dose absorbed under these conditions is 4 Gr. Studies have shown that the Luch (60So) g-irradiation device is a standard device for use in scientific research in this area, and the clonogenic activity in the line of melanoma cells V-16 in mice is significantly affected by radiation dose l, 7 × 10–2 Gr / s. attenuation was detected [2; Pp. 3–7]. As mentioned above,--radiation is now widely used in oncotherapy in the practice of oncoclinic medicine. For this purpose, a number of generations of radiation therapeutic devices (GUT-So-20, GUT-So-400, RUM-3, RUM-7, Agat-S) were created. -1 ”(Latvia) and has been widely used since 1975 [3; 330–331-b].
In addition to the treatment of tumors in superficial and deep tissues in clinical medical institutions, the device "LUCh-1", which is also used in scientific research, uses the isotope Cobalt-60 (60So) as a source of radiation.

Experimental protocols (scheme)

The experiments were performed in the following sequence, in several series: At the initial stage, at different ages, ie young (average body weight 90-110 g; 2 months), adults (average body weight 170-200 g; 6 months) , experimental hypokinesia was observed at different time intervals (1, 3, 10, 20, 30, and 60 days) in white, purebred rats (body weight 250–270 g; 24 months). Hypokinesia was performed using a generally accepted method. Rats with experimental hypokinesia were anesthetized using diethyl ether (medical anesthesia), anesthetized in a dislocation method, the abdominal cavity was surgically opened, and the liver was isolated. Also, for biochemical analysis during decapitation, blood was collected in sterilized glass test tubes with a volume of 10-20 ml.
In the next step, the liver tissue was pulverized and mixed with saline at a ratio of 1:10 to bring it to a homogeneous state. The prepared liver tissue homogenate was filtered and the activity of ALT, ASeT, amylase and lipase enzymes in the filtrate was determined. The value of enzyme activity studied was calculated relative to the value of 1 g mass of liver tissue. Simultaneously, the activity of ALT, AST, amylase and lipase enzymes in the blood of experimental animals was determined. Based on the results obtained, the correlation type correlation of the indicator values of the studied enzymes in liver tissue and blood was analyzed.

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Rats were selected as control groups in vivarium conditions, provided with standard food and water, in sufficiently wide cages, i.e., with limited mobility activity, exactly suitable for the age group of the experimental group. In this case, the nutritional content of rats in the experimental and control groups was uniformly rich in carbohydrates, proteins, fats and vitamins.

A method for determining the homogenate of liver tissue and amylolytic activity in serum (a amylase)

In the experiments performed, the amyolytic activity of liver tissue homogenate and serum (a amylase) was developed by Smith-Roe and Ugolev A.M. (1969) using a modified method. This method is based on the reduction of starch as a result of hydrolysis under the action of enzymes and the change in color of the starch component under the action of iodine. A 0.1% starch solution (pH = 7.2 under phosphate buffer conditions) was selected as the enzyme substrate. (a amylase) The value of amylolytic activity was expressed in terms of starch expressed in milligrams per minute.

The sequence of implementation of this method was as follows: 1 ml of dilute test material (liver tissue homogenate, blood serum) was taken and 3 ml of 0.1% starch was added. After the mixture was thoroughly mixed, it was incubated in a water bath at + 37 ° C for 30 min. Before starting the experiment, 0.5 ml of 3% potassium iodide solution was diluted 1: 3 in the solutions and mixed with 5 ml of water.

After incubation, 0.5 ml of 1 n HCl was added to the medium, the enzymatic reaction was stopped, and 1 ml of the incubation mixture was added to the prepared iodine solution. Starch reacts with iodine to form a blue complex. In the control group, 1 ml of buffer fluid was added to the iodine solution. These solutions were then analyzed calorimetrically relative to water in a red filter on an electrophotocalorimeter.

The amount of starch remaining after incubation was calculated using the following equation:

$$Крахмал\ \ (мг) = \frac{Тажриба.экстинцияси \times 3}{Назорат.экстинцияси}$$

In this case, the decrease in the amount of starch (mg) in the incubation medium as a result of hydrolysis is: 3 mg - x mg = u mg. Although radiotherapy has been proven to be one of the most effective methods in the treatment of oncological diseases, it is noted that radiation-induced impairment of liver function can lead to the development of serious pathological conditions [4; 1–9-p.]. In particular, more than 700,000 people worldwide are diagnosed with liver cancer each year, and the use of radiotherapy has not been fully clarified.

Because many researchers have noted that radiation causes serious pathological changes in liver cells, in turn, the value of the mortality rate of patients increases as a result of the negative effects of radiotherapy [5; 256–263-b.].

Liver parenchymal cells (Cooper cells), endothelial cells, stellate cells located in the central area are highly sensitive to radiation, and fibrosis occurs in hepatocytes under the influence of radiation [6; 291–296-b].

Thus, the study of the mechanisms of action of radiation on the structure and function of the liver is also important in terms of improving the methods of using radiotherapy and increasing its effectiveness [7; 154–158-p.].

These days, the level of mobility of people has decreased due to the automation and mechanization of work in all areas. This leads to hypodynamics, chronic sgressor condition, and various adaptive disorders [8; 10-b; 9; 4-5-b;].

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