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THE ACTION OF EXTRACTS OF OYSTER MUSHROOMS AND PLANT COLLECTION ON SURVIVAL AND THE AVERAGE LIFE EXPECTANCY OF IRRADIATED MICE

For many decades the most perspective direction in biology is the development of means of protection against the damaging action of ionizing radiation. The main attention is paid to the search for natural radioprotective drugs.

Extracts of plants and fungi have several advantages compared to synthetic resources: they have low toxicity, a broad spectrum of pharmacological activity, the ability to influence physiological processes in the human body and accordingly to increase the body's natural defenses, and are characterized by a gradual increase of the pharmacological effect [1]. In addition, natural remedies, obtained in the form of extracts, have on the patient's body a complex effect because they contain biologically active substances of different groups in a concentrated form [2]. The severity of the pharmacological effects of the extracts largely depends on the contained natural compounds.

Extracts of medicinal mushrooms represent a natural remedy broadest spectrum of activity with a huge preventative effect. Many medicinal mushrooms have anticancer properties. There are mushrooms with the most concentrated anti-tumor potential (Shiitake, *Agaricus blazei*, etc.) that are used in the main therapy against cancer, with the average and minimal antitumor property (Chaga, White fungus, etc.).

The oyster mushroom (*Pleurotus ostreatus*) is famous for its medicinal properties. From it is prepared the aqueous and ethanolic extract, which is used for the prevention of cancer, atherosclerosis, hypertension, etc. The Useful properties of the mushroom help to boost immunity, possess antiviral property and excrete salts of heavy metals and radionuclides. Oyster mushrooms contain proteins, amino acids, carbohydrates and some micronutrients. Polysaccharides in the mushroom, suspend the development and growth of malignant tumors.

They increase the work capacity of thymus cells. These cells are responsible for immunity. Cells are involved in the work, and begins to create a powerful immunological mechanism that suppresses cancer cells.

In earlier studies [3–16], we have been widely investigated radioprotective effect of extracts obtained from medicinal plants of Azerbaijan, rutin isolated from *Sophora japonica* and its complexes with metals.

The aim of this work was to assess radioprotective effect of extracts obtained from oyster mushroom (*Pleurotus ostreatus*) and plant collection consisting of marigold flowers (*Calendula officinalis*), St. John's wort (*Hypéricum perforátum*) and yarrow (*Achillea millefolium*).

Materials and methods

Experiments were performed on outbred mice weighing 20–25 g the Animals were kept in vivarium conditions on a standard diet. From the experiment animals were in accordance with the rules of the European Convention for the protection of vertebrate animals used for experimental and other scientific purposes.

To study radioprotective properties of extracts obtained from plants containing calendula, St. John's wort, yarrow (KSY) and mushroom of *Pleurotus ostreatus*.

Medicinal plants included in the collection were collected in summer-autumn period in Buynuz village of Ismayilli district of Azerbaijan Republic. The mycelium of oyster mushrooms grown on oat grain, and then were dried, crushed to powder and received extract.

To determine whether the radioprotective activity of the obtained extracts were tested for 30-day survival of irradiated animals. In the experiments used outbred mice weighing 20–25 g. Acute

toxicity was determined with the introduction of the investigated extracts in aqueous solution intraperitoneally once a method is in full accordance with accepted pharmaceutical methods. The observation of the behavior and registration of the death of the animals behaved for the first hour and then recorded the death of animals in the next five days after injection. Animals were irradiated at γ -install "ROUND – 20000" with the radiation source Co^{60} at a dose of 9 Gy; the dose is 0.396 Gy/sec. The investigated extracts was administered to animals in an aqueous solution 30 min before irradiation. Animals of the control groups at the same time and in equivolume quantities prior to irradiation was administered solvent – distilled water. To compare the radioprotective activity of the investigated extracts was used radioprotector-cystamine standard (bis-(β -aminoethyl) disulfide) at the optimum radioprotective dose of injected 30–35 min before irradiation.

The tests were performed on 30-day survival of irradiated mice in a dose of 9 Gy and the mean dose at 50 % survival of animals (SD_{50}) with the introduction of the extracts and average life expectancy (ALE) irradiated animals. In determining the acute toxicity after the administration of extracts at doses of 2000 and 1000 mg/kg a marked decline in respiratory function, the appearance of clinical seizures and 100 % death within 20 min. Reduction in dosage to 750 mg/kg resulted in 100 % death of the animals with the same symptoms within hours. The

introduction of the extract at a concentration of 500 mg/kg caused an ambiguous effect: in some cases we observed 100 % survival rate, others 50 % probability of death. The introduction of dosages of 250 mg/kg did not cause any deaths during all five days of observation. Thus, it can be concluded that the extracts also belong to low-toxic; SD_{50} for it is in the range of 350–500 mg/kg.

Results and discussion

The experiments were conducted on mice, which were injected extract of the oyster mushroom and integrated extract (KSY) at a concentration of 250 mg/kg 30 min before irradiation at a dose of 9 Gy and recorded the life time of irradiated animals during the month. In comparison, the radioprotective effect used radioprotector-cystamine standard and control group of animals to whom, instead of the radioprotector was administered distilled water.

Irradiation by gamma rays at doses of 9 Gy caused mice develop lesions of varying severity, characteristic of the marrowy form of acute radiation sickness. At the peak there was a gradual decrease in body weight, fluid intake and feed, inhibition of motor activity, disturbances in the hematopoietic system. The results of these studies showed that the application of extracts before oblucheniem allowed to increase the number of favorable outcomes.

The test results are shown in the table.

Table. The effect of extracts on the survival and life expectancy of lethally irradiated mice

Options	The number of mice	Survival rate, %	Life expectancy, day
Control (distil.water)	20	20	30 and more
Irradiated control	0	0	4.32 ± 1.21
Cystamine	16	80	8.32 ± 0.31
The extract of the oyster mushroom	13	65	16.3 ± 2.21
Integrated extract (KSY)	12	58	15.52 ± 1.4

Study of protective activity of the extracts showed that the extract of the mushroom *Pleurotus* has the highest radioprotective activity (65 %), somewhat inferior to the activity of the protector-standard cysteamine (80 %). Extract fee (KSY) reducing the lethal effects of ionizing radiation, improves survival and the average life expectancy of lethally irradiated mice, but the effects of it slightly inferior to the effect of the extract of mushrooms (65 %) and cysteamine (80 %).

Apparently, extracts in addition to the radioprotective activity have a wide range of pharmacological actions, which may include the enhancement of nonspecific resistance of organism, stimulation of various parts of the immune system, improving humoral regulation of reparative processes, antioxidant and adaptogenic action.

Conclusions

The obtained results suggests that the introduction of the oyster extract is a significant increase

in the life expectancy of animals, although the survival rate after 30 days is slightly inferior to that of the introduction of the radioprotector of the standard. In the case of a complex extract also increase the duration of life of irradiated animals, however, the percentage of survival after the end of the experiment – 30 days – less oyster extract.

The data obtained indicate the prospects of using oyster extract separately and in complex with extracts of calendula, St. John's wort and yarrow in

the development of pharmaceutical compositions intended for the prevention of local radiation injuries.

Are promising further research on the use of an extract of oyster mushrooms as an optional component in the complex treatment of malignant tumors.

The work is supported by Grant STCU (STCU) No. 6159.

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THE ACTION OF EXTRACTS OF OYSTER MUSHROOMS AND PLANT COLLECTION ON SURVIVAL AND THE AVERAGE LIFE

Aim. The aim of this work was to evaluate the effect of extracts obtained from oyster mushroom (*Pleurotus ostreatus*) and vegetable collection, consisting of marigold flowers (*Calendula officinalis*), St. John's wort (*Hypericum perforatum*) and yarrow (*Achillea millefolium*) on survival and the average life expectancy of irradiated mice. **Methods.** Medicinal plants included in the collection and of oyster mushrooms were dried, and were obtained the extract of water-alcohol mixture. Extracts vnutribryushinno was administered to mice at a concentration of 250 mg/kg 30 min before irradiation at a dose of 9 Gy. **Results.** It is found that the introduction of the extract of the oyster mushroom there is a significant increase of life expectancy of lethally irradiated animals, although the survival rate after 30 days is slightly inferior to that of the introduction of the radioprotector of the standard. In the case of a complex extract also increase the duration of life of irradiated animals, however, the percentage of survival after the end of the experiment – 30 days – less oyster extract. **Conclusions.** The data obtained indicate the prospects of using oyster extract separately and in complex with extracts of calendula, St. John's wort and yarrow in the development of pharmaceutical compositions intended for the prevention of local radiation injuries.

Keywords: mouse, survival, irradiation, extract.