The analysis of chromosome aberration in PBL is a sensitive and frequently applied method to assess the individual dose following accidental, occupational or medical exposure to ionizing radiation. According to standard protocol, lymphocytes are cultured in vitro for 12 h. Then, metaphases are harvested and chromosome aberrations are scored with the expectation that the data are representative of the whole cell population. However, it was shown that this protocol is not reliable in the case of high LET exposure. Protons induce a severe G2-arrest and the measurement of aberrations in metaphases at 12 h will result in very low RBE estimates, because heavily damaged cells are drastically delayed in their cell cycle and are not included in the analysis.

To overcome this problem, the measurement of aberrations in G2-cells collected at 12 h by chemically-induced PCC has been proposed.

To clarify this point we exposed lymphocytes of a healthy volunteer to protons or gamma-rays. Aberration yields were measured at 12 h measuring time in both first cycle G2-PCC and metaphase cells, and RBE values for the induction of 1 aberration per cell were derived.

Whole blood samples obtained from healthy donors were irradiated *in vitro*, with the ^{60}Co gamma-ray installation ROKUS-M, in a dose range from 0.5 to 2 Gy (dose rate 0.82 Gy/min), and with the synchrocyclotron therapeutic proton beam (Dzhelepov Laboratory of Nuclear Problems, JINR). Whole blood samples in the tubes were exposed to an unmodified proton beam entering the object with an energy of 150 MeV, the energy normally prepared for radiotherapy for patients. The dose rate was 1.3 Gy/min. In all experiments, cells were irradiated in a dose range from 0.5 to 2 Gy.

Culturing and fixation of human PBL was performed according to standard protocol recommended by the IAEA. The spectrum and the frequency of radiation-induced chromosomal aberrations of an unstable type was evaluated in the first post radiation mitosis (12 hours after the start of cultivation). Based on these results, the dose dependence of cells with chromosomal aberration formation and the total number of chromosomal aberrations in PBL under the influence of radiation *in vitro* has been found. Evaluation of the RBE of the therapeutic proton beam was conducted using the ratio of doses of proton and γ-radiation effects, at equal levels.

The curves of the frequency of unstable chromosomal aberrations have also been built using the CABAS software, which obtained curves that can be used as calibration curves for assessing dose in irradiated patients. It was shown that protons in the region of the Bragg Peak are more efficient in their damaging effects, while the effect of protons at the entrance is almost equivalent to the action of γ-rays.

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STUDYING OF INDIVIDUAL TYPES OF SPECIFIC TOXICITY OF INNOVATIVE INFUSION SOLUTION FOR PARENTERAL NUTRITION BASED ON AMINO ACIDS

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Biomedical and, in particular, immunotoxic and allergenic properties of the domestic innovative infusion solution for parenteral nutrition based on a balanced composition of amino acids, mineral salts and antihypoxic components (hereinafter referred as AMGV) were studied.

Keywords: immunotoxicity, allergenicity, hemagglutination reaction (HAR), delayed-type hypersensitivity reaction (DTHR), parenteral nutrition, amino acids.

The immunotoxic effect is traditionally understood as the modifying effect of xenobiotics and drugs on immunogenesis including immunosuppression and hyperstimulation of immunity, which can lead to a decrease in the resistance of the organism to infection, an increase in cancer risk, the development of autoimmune pathology and organism allergization. The main task of the preclinical study of the effect of potential medicines on the immune system is to prove or exclude the possibility of developing an immunotoxic action caused by a pharmacological agent or its metabolites in an animal experiment.

The objective is to study specific types of specific toxicity of an innovative infusion solution for parenteral nutrition based on amino acids AMGV.

Allergenic properties of the medicinal preparation (hereinafter referred as MP) for AMGV were studied by the reaction of general anaphylaxis in guinea pigs, as well as immunotoxic properties, including the evaluation of humoral (by hemagglutination reaction, HAR) and T-cell (by the delayed-type hypersensitivity reaction, DTHR) and the immunity of mice-hybrids of the first generation (CBA x C57BL) of both sexes.

Materials and methods: common methods and techniques used at the preclinical stage in assessing the allergenic and immunotoxic properties of MPs.

The reaction of anaphylaxis was assessed by external manifestations: respiratory rate, dyspnea, discoordination of the gait, rumpleness of the coat, nose scratching, convulsions, and death. The evaluation was performed in the early (5-10 minutes after intracardiac administration), distant (2 hours of follow-up) and late (after 18 hours) periods. The intensity of the reaction of anaphylaxis was assessed in Weigle scores.

The study of T-cell immunity was carried out by determining the local inflammatory response, which was assessed by measuring the thickness of the paws (DTHR) 24 hours after the administration of the resolving dose of erythrocytes of the sheep under aponeurosis of the right hind paw of mice.

Evaluation of humoral immunity was carried out by staging of HAR. The results were recorded visually.

During the study of immunotoxic properties of medicinal preparation AMGV we found the following:

- with the administration of medicinal preparation AMGV in a sensitizing dose of 0.013 ml / ind., a moderate shock response was recorded in two males. In females, the signs of manifestation of the reaction of anaphylaxis with the use of this dose were not found. In the groups of animals, with the introduction of a tenfold sensitizing dose (0.13 ml/ind.) in females and males, 2 individuals were detected in each group with a moderate shock reaction intensity, which resulted in an anaphylaxis intensity relative to a positive control of 24.95%;
- intramuscular intravenous administration of medicinal preparation AMGV in therapeutic and 2.5 times higher dose, did not cause a change in the response of cellular immunity in the delayed-type hypersensitivity test;
- the course administration of drugs at a dose of 50 ml / kg did not cause depression of the hemagglutination reaction; the results were within the limits of the values registered in the group of animals of intact control.

In conclusion, the developing infusion medicinal preparation for parenteral nutrition based on amino acids AMGV does not have allergenic and immunotoxic properties.

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THE STUDY OF PHOTO-SWITCHES BASED ON QUANTUM DOT-PHOTOCHROMIC MOLECULE COMPLEXES BY SPECTROPHOTOMETRY METHODS

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Currently, the research in the field of photochromic systems exhibiting modulation of fluorescence is carried out using organic phosphors. The use of quantum dots provides increased work life and image contrast compared to organic phosphors. Photo-switches based on quantum dot-photochromic molecule complexes which providing non-destructive reversible modulation of the fluorescence of quantum dots due to reverse transformations of photochromic compounds can be created.

Keywords: photo-switches, quantum dot, photochromic molecule, diaryletene, absorption spectrum.

Photo-switches based on quantum dot-photochromic molecules complexes which providing non-destructive reversible modulation of the fluorescence of quantum dots due to reverse transformations of photochromic compounds can be created by using the effect of inductive resonance energy transfer. The non-destructivness of reading of the fluorescent signal is achieved by choosing the spectral region of excitation of the quantum dots. This region does not overlap with the absorption bands of both forms of the photochromic compound. At present, the