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NON-INVASIVE CONTROL OF TRANSPORT FUNCTION OF FLUORESCENT COLORED LIPOSOMAL NANOPARTICLES

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ABSTRACT

Use of liposomal nanoparticles in them with the active substance incorporated is one of the promising tendencies in diagnosis and therapy. Development of such drugs allows overcoming

the natural barriers of the body more effectively, improve targeted delivery and reduce possible side effects. Pressing issue is the development of methods for in vivo evaluating the effectiveness of delivery of the active substance at various ways of use.

In this work, using the method of fluorescence spectroscopy we investigated the effectiveness of penetration of fluorescent liposomes when administered orally. Multilayer liposomes for this task were synthesized from lecithin-cholesterol method phase inversion. Fluorescent dye eosin-Y (the disodium salt of 2,4,5,7 tetrabromofluorescein) was encapsulated inside the liposome. Passive inclusion was performed at the stage of the lipid film hydration. Unrelated eosin was removed from the solution using dialysis.

Experimental studies were carried out on groups of clinically healthy mice outbred stock CD-1, formed by the analogue method. The model animals were divided into 4 groups which outside experiment received the same food. Three experimental groups received drugs by gavage for 6 weeks The first group did not receive any drugs and was as a control group during the experiment. The third group received pure dye without liposomes. The fourth group received liposomes with incorporated fluorescent dye. Eosin concentration in the diet of group 3 and 4 group was 5 mg per kg body weight.

Fluorescence channel with a fiber probe series of multifunctional laser non-invasive diagnostic system “LAKK-M” (“Lazma” Ltd, Russia) was used as the measuring equipment. Measurements were performed on the proximal part of the tail. Area of skin under study before each measurement was degreased with 96% ethanol solution. Prior to administration of the drug out procedure of measuring the background fluorescence at two excitation wavelengths of 365 nm and 450 nm was carried. Fluorescence spectra were recorded on the same wavelengths from the time of administration and further for 2 hours with an interval of 15 min.

The measurement results showed statistically significant increase in fluorescence intensity in the wavelength range 420-550 nm in the group of mice which received liposomes with the fluorescent dye. Maximum fluorescence intensity, 140% of the initial level, was recorded 30 min after oral administration. In the group of animals which received fluorescent dye without liposome membrane fluorescence the increase did not exceed 110% of the initial level. Mice receiving empty liposomes as well as the control group did not demonstrate statistically significant changes. Experimental results show that the received multilayer liposome particles may increase the effectiveness of the transported material entering the bloodstream via the gastrointestinal tract after oral administration.

The principal the possibility of express-control transcutaneous in vivo and in situ penetration and distribution of described liposomal form in an organism by fluorescence spectroscopy was also proved. The results can be used in the field of drug discovery, both in terms of development of new drugs and in high-throughput screening during their testing.