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Experimental treatment of hemolytic disease of the newborn

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A lot of diseases are connected with hemolysis: hemolytic disease of new-born infants, paroxysmal nocturnal hemoglobin uria, malaria and some medicines also cause hemolysis. In addition, the coronavirus COVID- 19 lowers the amount of hemoglobin due to damage to the erythrocyte membrane. The association of autoimmune hemolytic anemia during COVID-19 infection was described.

Hemolytic Disease of the Newborn (HDN) is a blood disorder in a fetus or newborn infant which can be fatal in some infants. The process of developing hemolytic disease is simple: during pregnancy through the placenta from the fetus to the mother Rh antigens enter. In response to this "invasion", maternal blood "produces" Rh antibodies to destroy Rh-positive erythrocytes of the fetus, damaging his liver and spleen, organs hematopoiesis and bone marrow. Maternal antibodies entering the bloodstream of a child contribute to hemolysis (destruction) of his red blood cells.

Known prophylactic treatment of pregnant women with Rhesus conflict for the prevention of hemolytic disease of the new-born. But this drug can cause allergic reactions, sometimes accompanied by anaphylactic shock. Therefore, the development of a non-toxic antihemolytic drug capable of inhibiting hemolysis is an urgent task.

In the study of polar negatively charged lipids we found a unique property of some mixtures of lipids inhibiting and preventing hemolysis. As a result of these studies, we have developed a liposomal anti-hemolytic drug. The antihemolytic preparation is the liposomes with the original lipid's structure on the basis of naturally negatively charged lipids. The antihemolytic preparation has been developed for treatment of the hemolytic disease of newborns. Research of liposomal antihemolytic preparation has been carried out in vivo and in vitro. For checking the biological activity of preparations for treatment of hemolytic disease of newborns we used models of animals with induced hemolytic disease. The hemolytic disease of newborns has been simulated on experimental animals (rabbits, rams) by introduction of the fatal dose of antibodies against erythrocytes. The experimental animals were observed under the certification received from the Committee on Bioethics and Deontology.

As much as possible, a positive therapeutic effect in vivo has been reached: 100 % of animals with induced hemolytic disease were healthy after one injection of our liposomal antihemolytic preparation. All animals of the control group with induced hemolytic disease without the preparation were lost. We discovered that the liposomes interact with the erythrocytes membrane to make them more stable against haemolysis and inactivate antibodies. Based on these studies, the technology of the sterile antihemolytic drug was developed for the treatment of hemolytic disease of the newborn (1% dispersion of liposomes with particle's size 140 nm).

Conclusion: This preparation can and should be used in pregnant women with Rhesus conflict with the fetus. The Rh factor in the baby's blood is set already from the third month of intrauterine development. Therefore, from this time, Rh antigens begin to enter the mother's body and respectively, from this time or earlier it would be possible to introduce pregnant drugs and repeatedly the drug is non-toxic, biodegradable, lipids are completely utilized in the body. This anti-hemolytic liposomal drug can be used to create liposomal vaccines and loaded

antiviral liposomal drugs to protect red blood cells from COVID-19 viral infection. The composition of this drug is original and is the intellectual property of Dr. Nina Ivanova and is protected by patents. Because of the war and the Russian attack on Ukraine, we will not be able to continue our research and bring the drug to its finished form. Therefore, we are ready for any kind of cooperation.

Biography

Nina Ivanova completed PhD from the State University Thin Chemical Technologies 1985 (Moscow, Russia). The speciality: bioorganic chemistry, chemistry of natural and physiologically active substances. After that she worked for 22 years as the head of the lipid laboratory in Biolek Company (Kharkiv, Ukraine). Since 2007 she worked as the leading researcher of the immunology and molecular genetics laboratory, SE Institute of dermatology and venerology of National Medical Science of Ukraine. She has more 80 publications and 30 patents. Her work: developing of the liposomal preparations for the treatment of Alzheimer's disease, hemolytic diseases, syphilis, anthelmintics in parasitology, anti-influenzal vaccine, antimycotics.

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