

STUDY OF THE INFLUENCE OF HUMIC ACID MACROMOLECULES ON THE STRUCTURE OF ERYTHROCYTES OF SOME ANIMALS BY METHOD OF ABSORPTION

Lavrik N.L.^a, Ilyitcheva T.N.^b

^a *Voevodsky Institute of Chemical Kinetics and Combustion, SB RAS, 630090, Novosibirsk, Institutskaya 3.*

e-mail: lavrik@kinetics.nsc.ru

^b *State Scientific Center of Virology and Biotechnology "Vektor", Koltzovo, 630060, Novosibirsk region.*

Recently, interest in the use of humic acids by HA for medical purposes has increased significantly. This interest is due to the fact that HAs have a positive effect on antioxidant properties, antiviral activity, the immune system, antibacterial activity, have anti-inflammatory properties, and also affect blood properties. In this regard, it seems relevant to study the interaction of HA with red blood cells, one of the main components of blood.

The purpose of this work was to determine the efficiency of the interaction of erythrocytes of some animals with humic macromolecules by the absorption method.

Erythrocyte absorption spectra were obtained from fresh chicken, goose and guinea pig blood in solutions with humic acids, isolated from brown coal, to study interactions between erythrocytes and humic acids, HA. It has been established that the addition of HA to erythrocytes leads to the differently directed shifts of Soret band maxima in the erythrocyte absorption spectrum. Thus, for a solution {guinea pig erythrocyte [$1.5 \cdot 10^{12}$ particle/l] + HA №1} this difference was $\Delta\lambda = +3.3$ nm (shortwave shift), for a solution {chicken erythrocyte [$2 \cdot 10^{12}$ particle/l] + HA №1}, $\Delta\lambda = -1.5$ nm (longwave shift), and for a solution {goose erythrocyte [$6 \cdot 10^{11}$ particle/l] + HA №1} $\Delta\lambda = +4.3$ nm (shortwave shift). A comparison of the absorption spectra of Guinea pig oxyhemoglobin with two HA samples indicates that at any erythrocyte concentrations, the positions of the Soret band maxima for various HA samples differ. The data obtained testify to the individual character of the interaction between erythrocyte membranes and HA macromolecules. Two hypotheses were proposed to account for the results obtained. 1 – «Structural hypothesis». In the framework of this hypothesis, the molecules of membrane-bound oxyhemoglobin are in erythrocyte volume, and can undergo noticeable, structural changes due to the deformation of erythrocyte membrane. 2 - «Complexing hypothesis». In terms of this hypothesis, the observed shifts of the position of the Soret band maxima can be explained by the possible penetration of light HA fragments through erythrocyte membrane into the inner erythrocyte region. This can cause the formation of complexes {oxyhemoglobin-HA}. In this case, the complex formation can involve both the free oxyhemoglobin molecules and the membrane-bound ones.