

Interactions of the antiviral drug glycyrrhizin and coronavirus E-protein with membrane mimetics by solution NMR studies

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Glycyrrhizin is the main active component in licorice root. Licorice root is a popular medicinal herb with nutritional and therapeutic values. There is a lot of data on its antiviral activity, including activity against SARS-coronavirus [1]. The mechanism of its antiviral action remains unclear. One of the possible mechanisms of the antiviral action of glycyrrhizin against COVID-19 is also considered to be the prevention of fusion of the virus envelope with the plasma membrane of the host cell [2]. E-protein inhibition reduces viral pathogenicity, suggesting that E-protein is a potential antiviral target [3]. The role of the E-protein in the functioning and pathogenesis of coronaviruses in general and SARS-CoV-2 in particular is unclear. The hypothesis of a targeted effect of glycyrrhizin on the coronavirus E-protein was tested.

The interaction of glycyrrhizin with model lipid membranes was studied by the NMR method. Bicelles DMPC/DHPC (molar ratio 1:2, $q=0.5$) was used as a membrane mimetic. Nuclear Overhauser Effect NMR spectroscopy (NOESY) was used to determine the localization of glycyrrhizin molecules in lipid bilayer. The transmembrane domain of SARS-CoV-2 E-protein (ETM) was used to study lipid-mediated effect of glycyrrhizin on viral proteins. Localization of ETM in lipid bilayer was also studied by the NOESY technique.

Experiments have shown the presence of an interaction between glycyrrhizin and the transmembrane domain of the E-protein SARS-CoV-2. Also, it was possible to observe the incorporation of the E-protein into the membrane mimetics.

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