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Design of a new model system for viral fusion

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The fusion of viral and host cell membranes is a pivotal step in the infection and life cycle of any virus. The coronaviridae present a taxonomic family with a complex and highly diverse fusion behavior across different species and viral host environments. Despite the massive global research interest in SARS-CoV-2 many aspects of the fusion process are still only rudimentarily understood. Biological fusion assays are widely applied to study different steps of viral-host membrane fusion, however, multidisciplinary approaches offer a broader range of parameters to study. Here, we report the establishment of a new model system for viral fusion based on the neutron scattering behavior of tailored unilamellar lipid vesicles with specific membrane proteins.

Our target was to design individual vesicles from cellular material which only contain the membrane proteins included in the initial cellular plasma membrane and none of the organelle membranes within the cell. Thus, by protein expression on the cells, individual virion and target vesicles could be designed. The results of creating 100 nm unilamellar vesicles were confirmed by several methods, among the dynamic light scattering as well as small-angle X-ray and neutron scattering.

In order to investigate specific features of infection by vesicle fusion in the initial infection stages of SARS-CoV-2 this model system can be fitted with any viral or host cell membrane protein on the surface.

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