

POSTER ABSTRACT PRESENTATIONS

SESSION TITLE: STRUCTURE OF VIRUSES AND CHAPERONINS

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Abstract P-44: SARS-CoV-2 Inactivation by Ultraviolet Light Does Not Violate Virus Morphology, Antigenic and Immunogenic Properties

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Background: Vaccination is the most effective tool for reducing the morbidity and mortality of COVID-19. Particular interest is the development of whole-virion inactivated vaccines, since such vaccines include a complete set of viral structural proteins. One of the requirements for the whole-virion vaccines is the guarantee of complete virus inactivation while maintaining the native conformation of protective antigens. The aim of this study is to evaluate the effect of ultraviolet (UV) treatment on the morphology, antigenic and immunogenic properties of the SARS-CoV-2.

Methods: SARS-CoV-2, strain "Dubrovka" (GenBank No.: MW514307.1), grown in Vero CCL81 cell culture (ATCC). Viral reproduction was monitored by real-time qRT-PCR, ELISA and virus titration in Vero cells. Virus was inactivated by treating with ultraviolet light for 5 minutes using a standard biosafety cabinet UV irradiator. Virus inactivation control was performed by three "blind" passages in Vero cells. Clarified viral material was concentrated on Amicon MWCO 100 kDa (Millipore) columns. Negatively stained with uranyl acetate viral preparation was examined by transmission electron microscopy (TEM). Mice were immunized with a UV-inactivated virus subcutaneously in two variants (5 animals per group) - with and without Freund's adjuvant, twice with an interval between immunizations of 2 weeks. The titer of virus-neutralizing antibodies in mouse sera was determined in Vero cell culture.

Results: Preparation of the SARS-CoV-2 coronavirus with a titer of 7.5 lg TCID₅₀/ml and concentration of viral RNA of 8.5 lg copies/ml was obtained in Vero cells. After UV-treatment the presence in the preparation of SARS-CoV-2 antigen was confirmed by ELISA with a set of COVID-19 convalescent sera.

The particles with coronavirus morphodiagnostic signs were imaged by TEM - rounded shape with characteristic spikes of 12-15 nm on the envelope, the diameter of the virion was 90-110 nm. Neutralizing antibodies were detected in the sera of all immunized mice, whereas in animals of the control group neutralizing antibodies were not detected. Neutralizing antibodies titer was significantly higher in animals immunized by a virus with Freund's adjuvant - on average 448, than without adjuvant - 64 ($p < 0.01$).

Conclusion: Treatment of SARS-CoV-2 by UV light completely inactivates its infectivity, while retaining the typical coronavirus virions morphology, antigenic properties, and ability to induce in mice a synthesis of neutralizing antibodies.

Key Words: SARS-CoV-2 • UV inactivation • transmission electron microscopy • neutralizing antibodies

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