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NEWS RELEASE

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FOR IMMEDIATE RELEASE

Research Shows Ushio's 222nm UV-C Light is Effective in Inactivating the Delta Variant of SARS-CoV-2

Cypress, California (December 2021) — A group of researchers including Professor Hiroki Oge of Hiroshima University Hospital's Department of Infectious Diseases and Professor Takemasa Sakaguchi of the Virology Department of Hiroshima University's Graduate School of Biomedical and Health Sciences recently evaluated the effect of irradiating the Delta variant of SARS-CoV-2 using Ushio's Care222® filtered far UV-C disinfection* technology.[1] This is part of joint research conducted by Hiroshima University and Ushio Inc. (head office: Tokyo; President and Chief Executive Officer: Koji Naito; hereinafter "Ushio"). The research is titled: "Study on the disinfection and viral inactivation effects of 222 nm UV-C light using Care222." The research showed that 222 nm UV-C light is equally effective in inactivating the Delta variant as in inactivating the original SARS-CoV-2 strain.

Outline

In this research study, a group consisting of Assistant Professor Hiroki Kitagawa, Assistant Professor Toshihito Nomura, and Professor Hiroki Oge of Hiroshima University Hospital's Department of Infectious Diseases as well as Professor Takemasa Sakaguchi of the Virology Department of Hiroshima University's Graduate School of Biomedical and Health Sciences used a unit equipped with Ushio's filtered far UV-C disinfection technology "Care222®," which combines an excimer lamp with a central wavelength of 222 nm and a special optical filter that removes harmful wavelengths, to irradiate a SARS-CoV-2 Delta variant. The study demonstrated that the Care222 far UV-C light is as effective against the Delta variant as it is against the original strain of COVID-19 and N501Y variants.[2]

Background

In a past study, this research group was the first in the world to demonstrate that a unit with Ushio's Care222 light technology inactivates the original strain of SARS-CoV-2[1]) and that the inactivation effect of UV-C light with a central wavelength of 222 nm on SARS-CoV-2 depends on cumulative illuminance regardless of lighting method (continuous, intermittent, etc.).[2]) The group also reported that 222 nm UV-C light would inactivate N501Y variants as effectively as it inactivates the original SARS-CoV-2 strain.[3])

COVID-19 infections are currently increasing due to multiple variants of SARS-SoV-2. According to an internal document from the U.S. Center for Disease Control, the basic reproduction number (R0) indicating how many people a single patient may infect ranged between two and three for the original strains, whereas it ranged between five and nine for the Delta variant, the same level as the chickenpox.[4]) The hospitalization rate of patients with the Delta variants is reported to be double the hospitalization rate of patients with the Alpha variant.[5]) Further, laboratory testing revealed that the Delta variant has greater resistance to neutralizing antibodies compared to the original strain of the virus, even in patients who have received two doses of a vaccine. This suggests a possible decrease in the vaccine's efficacy.[6]) At the same time, it is believed to be possible to predict the amount of UV-C light needed to inactivate the virus.[7]) The SARS-CoV-2 variants have mutations in some parts of the genome that occur during copying and proliferation that do not significantly affect the genome size or base composition that determines sensitivity to UV-C light.[8]) As such, researchers speculated that sensitivity to inactivation by 222 nm UV-C should not differ between the original strains and variants. The researchers had already shown that irradiation with 222 nm light inactivated the N501Y variants as effectively as it inactivated the original strain, as initially believed. The next step was to evaluate the effect of 222 nm UV-C light in inactivating the Delta variant.

Therefore, Ushio conducted a joint research project with researchers from Hiroshima University Hospital's Department of Infectious Diseases and the Virology Department of Hiroshima University's Graduate School of Biomedical and Health Sciences to verify that irradiation with UV-C light with 222 nm wavelength would inactivate the Delta variant equally effectively.

Evaluation contents and results

A whole-genome analysis was performed on SARS-CoV-2 clinical isolates, and the WHO confirmed that the isolates were the B.1.617.2 Delta variant. The variant, first identified in India, is categorized as "variant of concern." We evaluated the effect of 222 nm UV-C light in the inactivation of these isolates.

For each of the SARS-CoV-2 variants, a 5 μL of viral liquid was dripped onto a plastic petri dish, which was then irradiated with 222 nm UV-C light at 2, 4 and 6 mJ/cm^2. Viral infectivity after ultraviolet ray irradiation was evaluated using the TCID50 method to evaluate the viral inactivation effects at the different illuminances compared with the infectivity of non-irradiated samples (n = 2). As initially estimated, 222 nm ultraviolet rays were shown to be as effective at inactivating the Delta variant as the original strain of the virus (see the figure and table below).

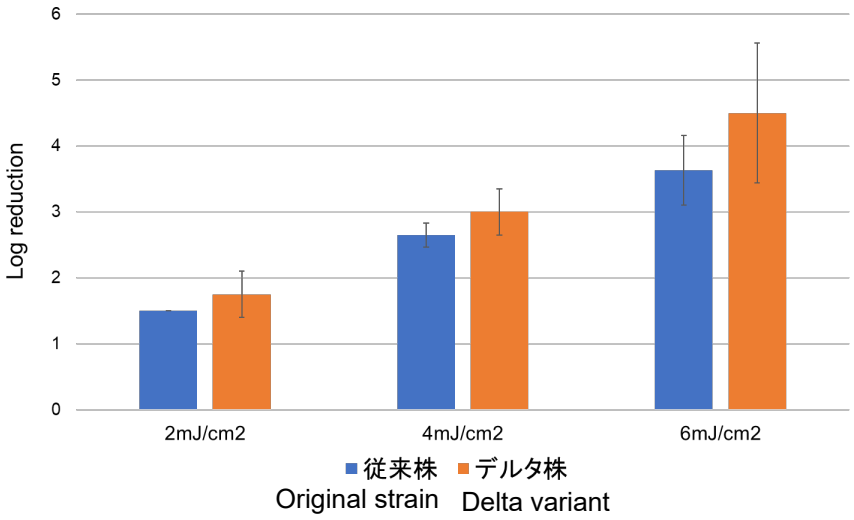

Figure. The SARS-CoV-2 inactivation effects of 222 nm UV-C

Table. Data on SARS-CoV-2 inactivation by 222 nm UV-C

	2mJ/cm^2	4mJ/cm^2	6mJ/cm^2
従来株 Original strain	1.50 (0.0)	2.65 (0.18)	3.63 (0.53)
デルタ株 Delta variant	1.75 (0.35)	3.00(0.35)	4.50 (1.06)

※Log reduction 平均値 （標準偏差）

Original strain - Delta variant - Average log-reduction (SD)

UV-C light has been used for pathogen disinfection, water treatment, air conditioning, and disinfecting objects for more than a century. The amount of UV exposure necessary for inactivating microorganisms varies, but no known microorganisms have acquired UV-C resistance. So far, it has been demonstrated that the SARS-CoV-2 Delta variant is as sensitive to 222 nm UV-C light as the other variants.

*All references to “disinfection” are referring generally to the reduction of pathogenic bioburden and are not intended to refer to any specific definition of the term as may be used for other purposes by the U.S. Food and Drug Administration or the U.S. Environmental Protection Agency.

[1]Variant
In general, viruses with slightly different genome sequences appear through processes of copying and proliferation. These viruses with different genome sequences are called variants, and some variants will be more infectious or cause more severe symptoms due to the genome sequence changes.

[2]See our press release titled “Research Confirms Ushio’s Care222® Far UV-C Technology Is Effective Against a Variant of SARS-CoV-2, the Virus That Causes COVID-19“ https://www.ushio.com/research-confirms-ushios-care222-far-uv-c-technology-is-effective-against-a-variant-of-sars-cov-2-the-virus-that-causes-covid-19/

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3） Research Confirms Ushio’s Care222 Far UV-C Technology Is Effective Against a Variant of SARS-CoV-2, the Virus That Causes COVID-19https://www.ushio.co.jp/jp/news/1002/2021-2021/500814.html

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Ushio’s Care222 filtered far UV-C disinfection technology

Ushio’s Care222 technology combines an excimer lamp with a peak wavelength of 222 nm with a special optical filter to block wavelengths above 230 nm. Irradiation with UV-C light with wavelengths above 230 nm can be harmful to skin and eyes if they are exposed for an extended period.

Reference

For more information about Care222® visit www.care222.com

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Hiroshima Prefectural Vocational School and the affiliated hospital, which became the predecessor organization of the current university, were founded in 1945. It then became a prefectural medical university and finally a national university in 1953. It is one of Japan's best medical institutions with advanced medical technology and has 47 healthcare departments, including medicine and dentistry. It contributes to the only child cancer hospital in the Chugoku and Shikoku regions and regional healthcare by coordinating with the authorities and other medical institutions, for example during disasters and the current COVID-19 pandemic.
https://www.hiroshima-u.ac.jp/hosp

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