CORPORATE NEWS

July 16, 2020

Daikin Confirms Effectiveness of Streamer Technology to Inactivate Coronaviruses (SARS-CoV-2) and Mouse hepatitis virus A59 (MHV-A59)

Inactivation of the Novel Coronavirus (SARS-CoV-2) Exceeds 99.9% in 3 Hours

Daikin Industries, Ltd., in cooperation with Professor Shigeru Kyuwa, Department of Biomedical Science, Graduate School of Agriculture and Life Science, the University of Tokyo, and a group of research professors led by Professor Shigeru Morikawa, Department of Microbiology, Faculty of Veterinary Medicine, Okayama University of Science, have demonstrated that Daikin's unique Streamer technology has an inactivating effect on Coronavirus (SARS-CoV-2) and Mouse hepatitis virus A59 (MHV-A59).

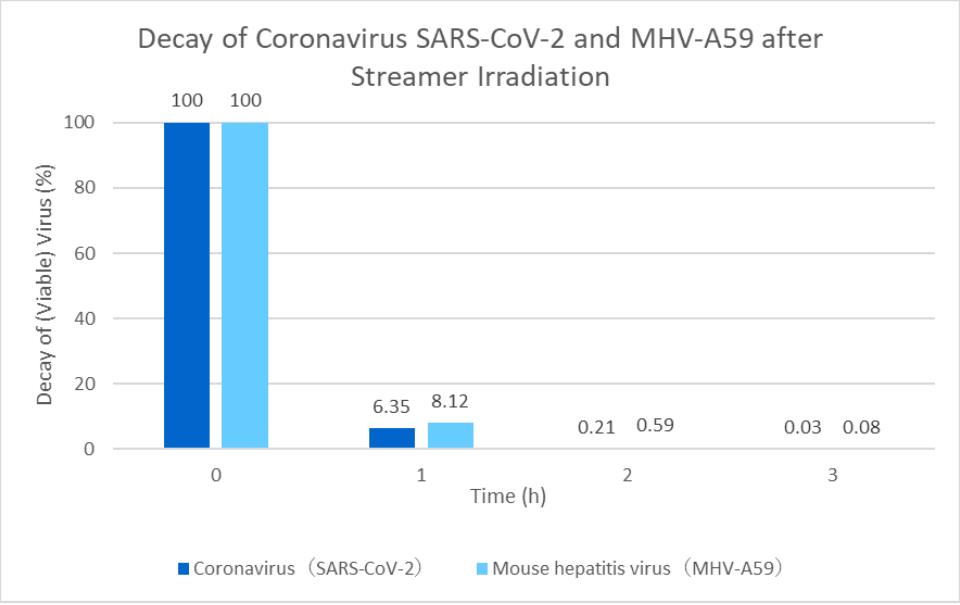
In seeking to verify the effectiveness of Streamer technology since 2004, Daikin has previously demonstrated over 60 types of harmful substances, such as bacteria, allergens and viruses including influenza virus (type A, H5N1) and mouse noroviruses, to be suppressed or inactivated by Streamer technology. From the latest study, Daikin has confirmed that Streamer technology inactivates more than 99.9% of coronavirus (SARS-CoV-2) and mouse hepatitis virus A59 (MHV-A59) after irradiating the viruses for three hours with Streamer discharge.

This demonstration shows the results of experiments using a device that generated Streamer discharge under test conditions and does not indicate the effectiveness of an actual Streamer product in use under actual conditions (living space).

■ Experimental Results

Irradiation with Streamer discharge for one hour inactivated 93.6% of coronavirus (SAR-CoV-2) and 91.8% of mouse hepatitis virus A59 (MHV-A59).

Irradiation with Streamer discharge for three hours inactivated more than 99.9% of coronavirus (SARS-CoV-2) and mouse hepatitis virus A59 (MHV-A59).



Source1: "Study report on the inactivation effect of plasma ion generator (Daikin Streamer) on SARS-CoV-2" written by Shigeru Morikawa, Department of Veterinary Medicine, Microbiology Course, Okayama University of Science.

Source2: "Study on inactivation of plasma ion generator (Daikin streamer) against mouse coronavirus" written by Shigeru Kyuwa, Laboratory of Animal Science, Graduate School of Agricultural and Life Sciences, University of Tokyo

This document is an English translation for understanding the contents of Daikin press release that introduces the results of experiments using the Streamer discharge device. The effect of products equipped with Streamer technology or the effect in actual use environment may differ. This English translation cannot be used in association with products, including sales promotion (such as proposal materials for product sales).

■ Evaluation Method

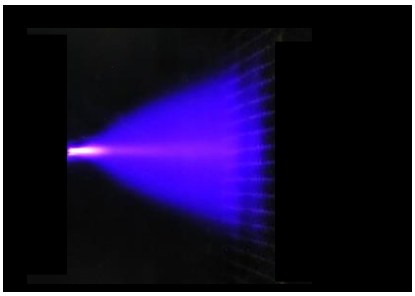
The mouse hepatitis virus strain A59 (MHV-A59) is a virus that belongs to the Betacoronavirus genus of the Coronaviridae family, a family of enveloped, positive-sense, single-stranded RNA viruses in the Nidovirales order, and is one of the viruses belonging to same genus as coronavirus (SARS-CoV-2). Firstly, an experimental system was established using mouse hepatitis virus A59 (MHV-A59), and then an evaluation was performed using coronavirus (SAR-CoV-2).

In this experimental system, two acrylic boxes of about 31L were mounted inside a safety cabinet. One box was equipped with a Streamer discharge device and the other box was not. A see-saw rocking motion shaker was placed in each box, and a six-well plate was placed on top of the motion shaker. Virus solution measuring 0.5 ml was put into each well of the plates, and Streamer irradiation was performed while agitating the solution using the motion shaker (approximately 12 times per minute). Virus solution was collected from two wells every hour for three hours, and viral load was measured.

The viral load for mouse hepatitis virus A59 (MHV-A59) was quantified by the plaque method using DBT cells, whereas the viral load for coronavirus (SARS-CoV-2) was quantified by the $TCID_{50}$ method using Vero E6 / TMPRSS2 cells.

■ Streamer Technology

Streamer technology is a technology that uses Streamer discharge, which Daikin developed in 2004, to perform oxidative decomposition of harmful substances. It is a type of plasma discharge featuring an innovative air purification technology that stably generates “high-speed electrons,” a feat which had proven difficult up to that time. Its oxidative decomposition capability is much greater than that of conventional plasma discharge (glow discharge). Moreover, when combined with air components, these high-speed electrons have a capability for powerful oxidative decomposition, and this capability enables Streamer discharge to continuously remove odors, bacterias, and indoor air pollutants such as formaldehyde.



Streamer Discharge

To date, Daikin has been collaborating with universities and public research institutes to demonstrate the effectiveness of this technology for highly virulent influenza viruses (A-type H5N1), weakly virulent influenza viruses (A-type H1N1), mouse norovirus, and toxins and bacterias that cause food poisoning.

■ Types of viruses that have been demonstrated so far

In addition to below viruses, the effectiveness against 7 types of bacteria such as Legionella and Pseudomonas aeruginosa, 30 types of allergens such as cedar pollen and Dermatophagoides farinae (excrement/carcass), and 19 types of harmful chemical substances have been verified by public institutions.

Demonstrated Viruses	Institute	Report Date
New influenza virus (A type H1N1 type)	Vietnam National Institute of Hygiene and Epidemiology	14-Sep-2009
Avian influenza virus (A type H5N1 type)	Vietnam National Institute of Hygiene and Epidemiology	16-Apr-2009
Influenza virus (H3N2 type)	Shanghai City Disease Control Center etc.	22-Feb-2010
RS virus	Wakayama Medical University	24-Apr-2012
Adenovirus, Coxsackie virus, Enterovirus, Ecovirus, Measles virus	Kitasato Environmental Science Center	29-Jun-2017
Mouse norovirus	University of Tokyo	11-Oct-2018