

2020 08/26 wed Press release

Professor Takayuki Murata of our university discovered for the first time in the world the fact that the new coronavirus can be inactivated with low-concentration ozone gas that is safe for the human body.

A research group led by Professor Takayuki Murata (virus and parasitology) of Fujita Medical University (1-98, Kutsukake-cho, Toyoake-shi, Aichi) has found that even low concentrations (0.05 or 0.1 ppm) of ozone gas can be used against the new coronavirus. It was clarified experimentally for the first time in the world that it has a decontamination effect.

With this discovery, even in places where people gather, such as medical facilities and public transportation, ozone generators (devices that can maintain low concentration and appropriate concentration control) are always used to protect against new coronavirus infection at concentrations acceptable to the human body. It can be used. Fujita Medical University Hospital will start efforts to reduce the risk of infection in waiting rooms and hospital rooms in hospitals from the beginning of September by using ozone generators that have already been introduced.

Research background

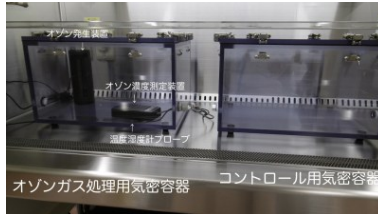
Ozone gas is known to have the effect of inactivating many pathogens, and it has already been reported that it is also effective against the new coronavirus. However, the previously reported experiments used high-concentration ozone gas of 1.0 to 6.0 ppm, and there was concern about toxicity to the human body.

This time, Professor Murata's research group at our university has clarified that ozone gas has a decontaminating effect on the new coronavirus even at low concentrations (experiments at 0.05 and 0.1 ppm) that are acceptable to the human body. We believe that this will be the basic evidence for controlling and preventing the spread of infection.

Experimental methods and materials

1. The virus solution of the new coronavirus is attached to a stainless steel carrier, dried, and placed in an acrylic airtight container. The airtight container contains an ozone gas generator, an ozone gas concentration measuring device, a thermometer, and a hygrometer, and the system treats the carrier with the virus attached at 0.05 or 0.1 ppm for a predetermined time with ozone gas. The amount of ozone exposure is based on the CT value, which is the integration of concentration (ppm) and time (minutes).
2. After the treatment is completed, the virus attached to the stainless steel is turbidized with a culture solution and collected. Furthermore, the collected virus suspension is appropriately diluted to infect VeroE6 / TMPRSS2 cells, and an index of tissue culture infectious dose 50 (TCID50) is calculated. TCID50 is an indicator of infectious viral load. Two or three independent trials were performed under the same conditions and the average value was taken. ...

- VeroE6 / TMPRSS2 cells were obtained from the Japanese Collection of Research Bioresources Cell Bank (JCRB). As for the virus, the new coronavirus, which was transferred through formal procedures from the Kanagawa Prefectural Institute of Public Health, was amplified in VeroE6 / TMPRSS2 cells and used in the experiment.
- All experiments were conducted at the Biosafety Level 3 (BSL3) experimental facility set up at Fujita Medical University, with appropriate containment measures taken. After the experiment, all instruments and reagents are completely sterilized by high-pressure steam sterilization (autoclave).

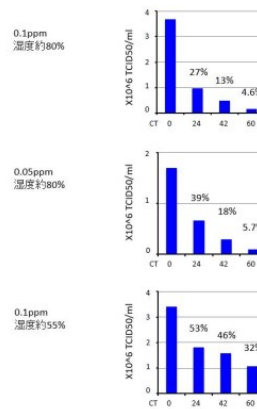


Experimental result

The graph on the right shows the average value of each TCID50 in an environment with humidity of 80% and 55%.

At a humidity of 80%, the virus infectivity was reduced to 4.6% at CT60 (10 hours later) even with 0.1 ppm ozone gas treatment, which is the Japanese work environment standard. The more stringent US Food and Drug Administration standard of 0.05 ppm ozone gas reduced virus infectivity to 5.7%.

At a humidity of 55%, the decontamination effect of ozone gas was diminished, but with ozone gas 0.1ppm treatment, the infectivity was halved to 53% at CT24 (4 hours later).



* The Japan Society for Occupational Health recommends that the permissible ozone concentration as a work environment standard is 0.1 ppm (average exposure concentration when workers are exposed to 8 hours a day and 40 hours a week).

Consideration

Experiments have shown that even ozone gas with a concentration that is harmless to the human body has the effect of suppressing the infectivity of the new coronavirus. It was also revealed that the effect is high especially in high humidity conditions. This study is the first in the world to suggest that continuous low-concentration ozone gas treatment may reduce the transmission of the new coronavirus, especially in humid rooms, even in a human environment. It became a basic research.

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