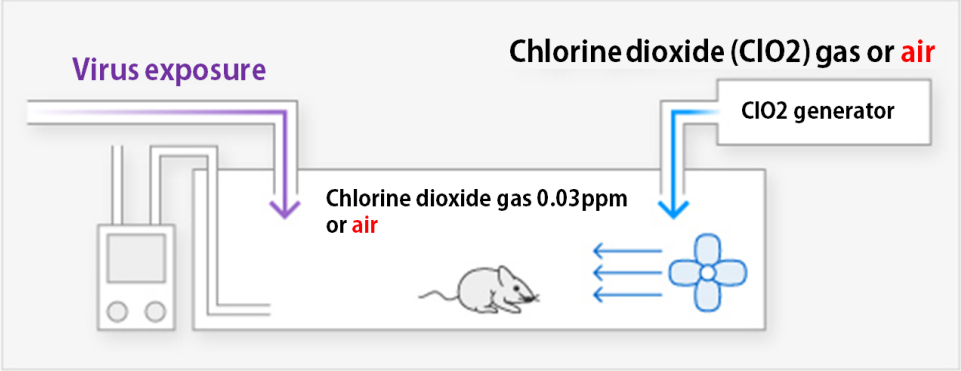
Academic data with chlorine dioxide gas

Virus validation data

Virus I

■ Method

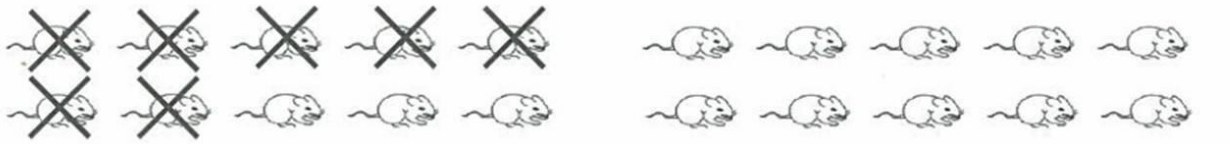
At the same time as virus I (1 LD 50), chlorine dioxide gas (0.03 ppm) or air was exposed for 15 minutes, and the mortality of 10 mice was compared for 21 days.



■Result－1

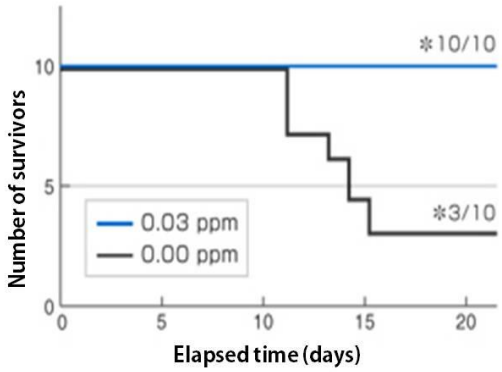
Comparison of the survival rate of mice in the space exposed to the virus. The survival rate for air alone is 30%. The survival rate in the case of low concentration chlorine dioxide (0.03 ppm) is 100%.

Human-tolerable levels of chlorine dioxide gas for a long period of time are 0.1 ppm [human 8-hour weighted average (TWA)]



Air: 7 out of 10 dead

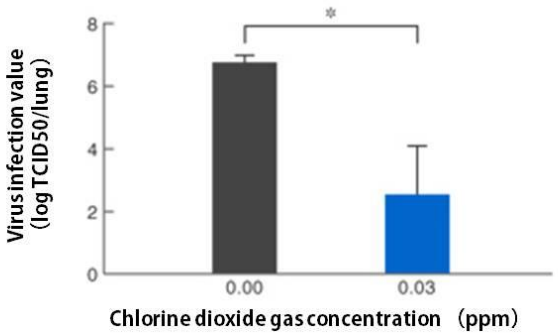
Low concentration chlorine dioxide gas (0.03ppm): No death



Chlorine dioxide gas concentration: 0.03ppm
Virus titer: 1LD50　Exposure time: 15 minutes　Number of specimens: n = 10
＊: p＝0.002(21 days comparison)

■Result－2

In the presence of chlorine dioxide gas (0.03 ppm), virus I in the lungs of mice was significantly reduced (p = 0.003).

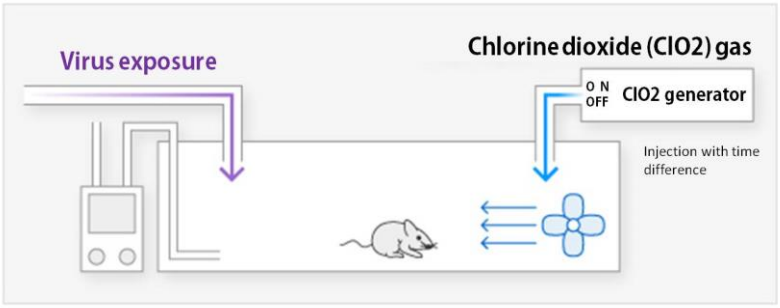


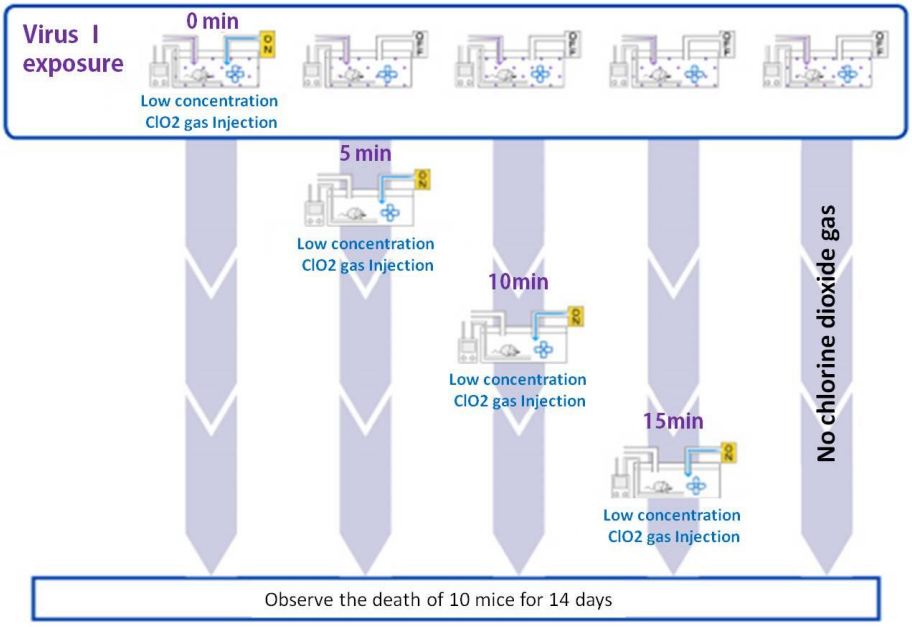
Chlorine dioxide gas concentration: 0.03ppm
Virus titer: 1LD50 Exposure time: 15 minutes Number of specimens: n = 5
mean±S0 * : p=0.03

Ogata N. and Shibata T.*J Gen Virol* **89**. 60-67 (2008)

■ Method

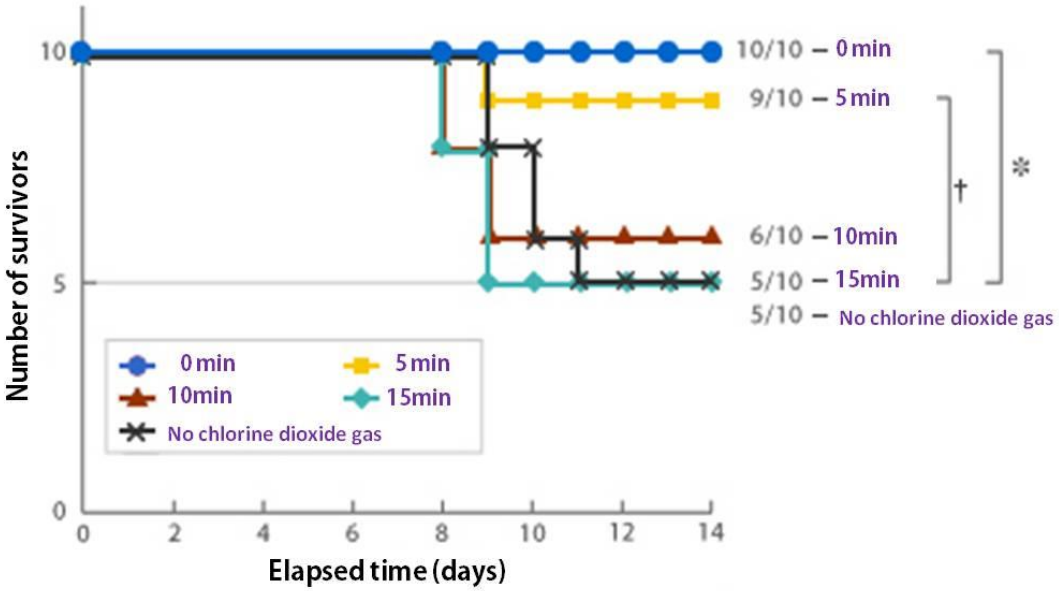
Comparison of mortality between mice exposed to chlorine dioxide gas (0.03 ppm) and mice not exposed to chlorine dioxide gas. Ten mice were each exposed to virus I (1LD50), and their follow-up was observed after 0 min, 5 min, 10 min and 15 min.





■Result

For mice exposed to virus I. Mice without chlorine dioxide exposure: 5 died. When chlorine dioxide gas is injected after 15 minutes: 5 dead. On the other hand, no deaths were observed in mice exposed to chlorine dioxide gas at the same time as virus I ($p = 0.022$). Furthermore, although there was no statistically significant difference ($p = 0.081$), only one animal died when exposed to chlorine dioxide gas after 5 minutes.



Chlorine dioxide gas concentration: 0.03ppm
Virus titer: $1LD_{50}$ Exposure time: 15 minutes Number of specimens: n = 10
* : p=0.002 † : p=0.081 (14 days comparison)

Ogata N. and Shibata T.*J Gen Virol* **89**. 60-67 (2008)

Virus N

■Method

In a closed space (20 ° C, 150 L), place virus N suspension (wet state) or dry virus N (dry state) in a glass petri dish, and expose to chlorine dioxide gas for a predetermined time, and measured the infection value against the virus.

As a control, the same test was performed with air alone, and the virus infection value was measured. At this time, the effect of organic substances was confirmed by adding a predetermined concentration of fetal bovine serum (FBS) to virus N.

The relative humidity in the environment is medium humidity (45-55%) when exposed to virus N suspension (wet state) and medium humidity (45-55%) when exposed to dry virus N (dry state). Or set to high humidity (75-85%), and confirmed the effect of humidity.

■Result－1

When organic substance (FBS) is not added when low-concentration chlorine dioxide gas (average 0.08 ppm) is exposed to virus N suspension (wet state) in an environment of 20 ° C and medium humidity (45-55%) for 6 hours The virus infection titer decreased by more than 99.99% compared to the control. It was found that when organic substances (FBS) were added, the effect of lowering the viral infectivity due to low-concentration chlorine dioxide gas was suppressed.

(Relative humidity 45-55%)

Gas exposure time (hours)	FBS concentration in suspension (%)	Virus infection value (Log_{10} [$TCID_{50}$ / 50μl])		Reduction of virus infection value (log_{10})
		Air (control)	Chlorine dioxide gas (average 0.08ppm)	
6	0	6.2	<0.5	>5.7
	0.1	6.3	1.1	5.2
	0.25	6.3	2.4	3.9
	0.5	6.4	2.8	3.6
	0.75	6.4	3.8	2.6
	1	6.4	4.2	2.2

■Result－2

The virus infection titer of dry virus N (dry state) is 99.99% or more in high humidity (75-85%) environment when exposed to low concentration chlorine dioxide gas (about 0.08 ppm) at 20 ° C for 24 hours. The price dropped. The virus removal action was found to be suppressed by adding organic substances (5% FBS).Under medium humidity (45-55%) environment, there was almost no decrease in viral infectivity due to low-concentration chlorine dioxide gas.

Gas exposure time (hours)	Chlorine dioxide gas concentration (ppm)	Reduction of virus infection value (log_{10})			
		Relative humidity 45-55%		Relative humidity 75-85%	
		5%FBS(-)	5%FBS(+)	5%FBS(-)	5%FBS(+)
24	0.08	<0.5	<0.5	6.1	2.0
	0.26	1.0	0.6	6.3	6.5
	0.8	0.8	0.8	4.4	5.7
	8	1.3	2.1	4.6	6.0

Morino H., et al. Biocontrol Science, 14（4）,147-153 (2009).

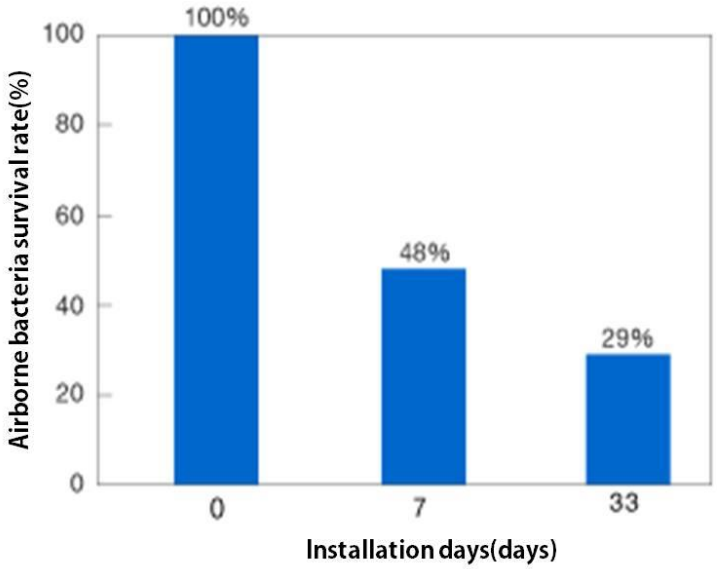
Bacteria verification data

■Method

After installing a chlorine dioxide gas generating product in the hospital dissection room for a predetermined number of days, airborne bacteria were captured on an agar medium using an air sampler, and the agar medium was cultured to measure the airborne bacteria.

■Result

It was found that the amount of airborne bacteria in the room decreased by installing a product that generates chlorine dioxide gas.



Verification data of Taiko Pharmaceutical Co.,Ltd.

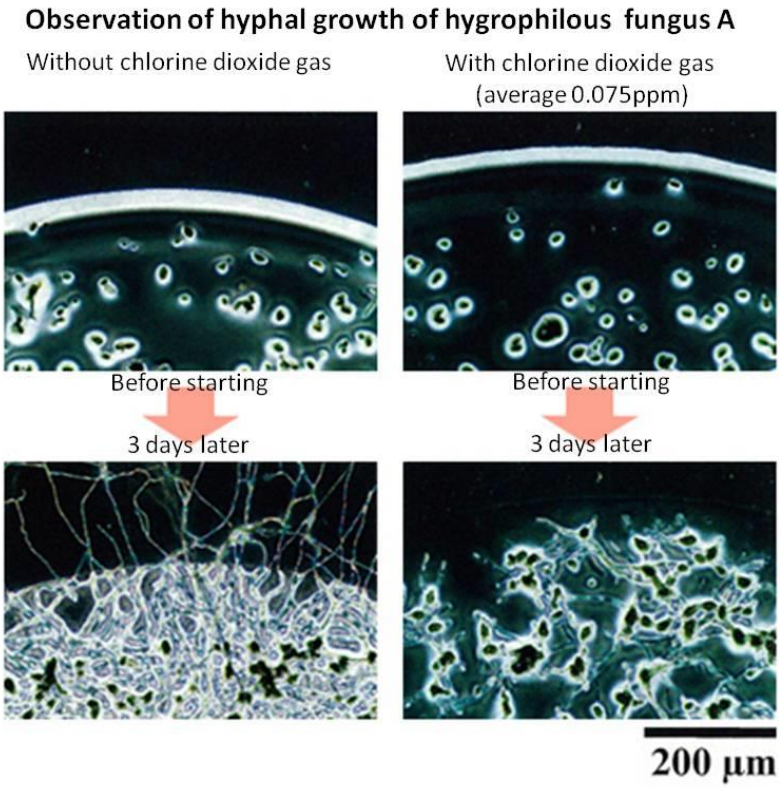
Fungal verification data

■Method

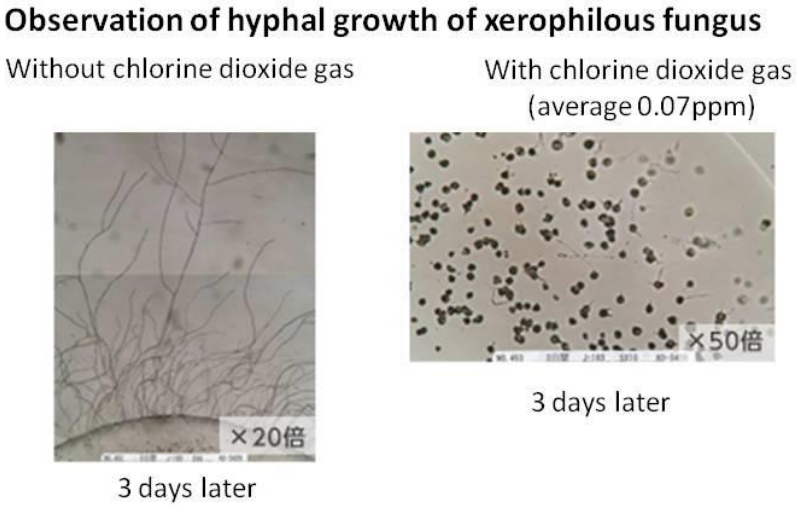
A small mold (fungal) sensor was placed in an air environment at 25 ° C or in a low-concentration chlorine dioxide gas environment. After exposure for 3 days, the images were taken under a phase contrast microscope.

■Result

In a low-concentration chlorine dioxide gas environment, both hygrophilous fungus A and xerophilous fungus E both inhibited hyphal growth.



Morino H., et al. Yakugaku Zasshi 127, 773-777 (2007).



Hirofumi Morino, Takashi Shibata Clinical allergy 30（1）, 51-55(2010)