



# Cleanbay Air

Virus Prevention, Sanitization & Deodorization

**Prevention is the best way to stay healthy.**

# Cleanbay Air

## Product Description

Cleanbay Air effectively kills pathogenic microorganisms such as fungi, bacteria, and viruses.

## The Power of Solid Chloride dioxide

- Strong Antibacterial Effect: Solid chloride dioxide has two and a half times more oxidizing power than general chlorine agents used for disinfectant. Effectively eliminates bacteria, mold, etc.
- Strong Deodorization: During oxidation, gives off chlorine oxide gas, and it decomposes hydrogen sulfide, mercaptan and other causes of bad odor emitted from the septic matter.
- Safe to Use: United Nations Food Committee approved Solid Chloride dioxide as Class A-1 which is in the same category as sugar and salt.

## Instruction

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Remove the product from the packaging and peel off the sticker. Use attached clip to hang from the chest pocket, bag, etc.

## Effective Period

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Once opened, effective for up to one month.  
The effective period may differ under different circumstances.

## Cautions for use

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- Do not ingest the product. Do not use for any other purposes.
- Less likely to be effective outdoors in windy conditions. More effective under shelter.
- Immediately stop the use of the product if you experience any adverse effects.
- If ingested, drink plenty of water and try to disgorge the product. Immediately seek medical advice.
- In case of skin and eye contact, wash with plenty of water. Seek medical advice if needed.
- May cause corrosion and rust if used on or near metal objects.
- Avoid contact with water.
- Do not use near naked flame or sources of ignition. Avoid high temperatures and direct sunlight.
- Store in a sealed container when not in use.



# Cleanbay Air

## Cleanbay Air usage

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1. For Elderly and Children who have low immunity
2. If you have High Fever
3. Office
4. Students & Schools
5. Hospital Staff, Medical Cadre & Medical institutions
6. In the Car
7. If you get sick easily
8. Any public place with large groups of people

## 1. Effects of stabilized chlorine dioxide

Stabilized chlorine dioxide has the following properties:

- (i) Instantaneous sterilizing and inactivating effects on various microorganisms, such as bacteria, fungi (molds), viruses, protozoa, and spores (i.e., 2.6-fold higher oxidative activity than chlorine and 10-100-fold stronger instantaneous effects than hypochlorite);
- (ii) Excellent deodorizing effects;
- (iii) Low toxicity to human body;
- (iv) No harmful byproducts (trihalomethane);
- (v) Effectiveness at a wide pH range (pH 1-10);
- (vi) Low corrosivity;
- (vii) High biodegradability (low environmental load); and
- (viii) High usability.

Stabilized chlorine dioxide in Cleanbay Air is formulated to facilitate the long-time production of a small amount of chlorine dioxide, an active ingredient.

## 2. Safe applications of stabilized chlorine dioxide

1) Approved safe applications of chlorine dioxide

Organizations	Approved safe applications
Ministry of Health, Labour and Welfare and Ministry of Economy, Trade, and Industry	Approved as a disinfectant for drinking water in April 2000 ( $\leq 0.6$ mg/L) Approved as a flour bleaching agent and a disinfectant for pool and public bath water Food additives (sodium chlorite and acid atmosphere under some conditions)
World Health Organization (WHO)	A-1 class
Joint FAO/WHO Expert Committee on Food Additives (JECFA)	Acceptable daily intake (ADI Approved as A-1 class* *; Sufficient information is available for evaluation. ADI can be determined or is toxicologically unnecessary.
Food and Drug Administration (FDA)	Approved as a food additive and a disinfectant for medical equipment and devices
Environmental Protection Agency (EPA)	Approved for use in drinking water, industrial wastewater treatment, and environmental cleanup
United States Department of Agriculture (USDA) and Food Safety and Inspection Service (FSIS)	Approved for use in foods and meat
National Aeronautics and Space Administration (NASA)	Adopt to sterilize space foods (e.g., in space shuttle)
Hazard Analysis and Critical Control Point (HACCP)	Officially adopted to disinfect meat with a high risk of food poisoning
Others foreign countries	Approved for use in drinking water and medical purposes and as a food additive in many countries



2) Working environment standards

TLV-TWA (labor and environmental standards for eight hours): 0.1 ppm

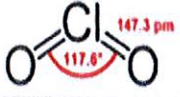
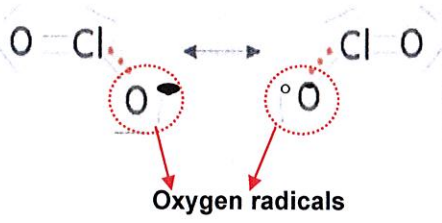

TLV-STEL (labor and environmental standards for a short period of time (15 minutes): 0.3 ppm

3) The safety and efficacy of stabilized chlorine dioxide for Cleanbay Air were demonstrated by U.S. EPA, FDA, and USDA.

### 3. Properties of chlorine dioxide

- Chemical formula: ClO<sub>2</sub>
- Molecular weight: 67.45
- Boiling/melting points: 11°C/-59°C
- Relative density: 2.33 (11°C, air = 1.0)
- Color: yellow red
- Odor: peculiar odor similar to that of chlorine
- Water solubility: highly soluble (about 2,600 ppm under standard conditions, 0.8 g/100 ml · 20°C)

1) Structure and mechanism of action of chlorine dioxide

Molecular model	Mechanism of action	
		<p>Oxygen radicals with higher oxidative activity than chlorine dioxide is generated.</p> <p>⇒ oxidative modification (denaturation) of target substances (e.g. proteins) by oxygen radicals</p> <p>⇒ bactericidal or deodorizing effects</p>
		

2) Bactericidal properties of chlorine dioxide

**(i) Bactericidal spectrum**

Microbial classification	Microbial species
Bacteria:	<b>E. coli, O-157, P. aeruginosa, S. aureus, vancomycin-resistant S. aureus, MRSA, M. tuberculosis, etc.</b>
Fungi:	<b>A. niger, P. citrinum, Candida</b> fungi, and yeast fungi
Viruses:	Influenza virus, hepatitis virus, polio virus, norovirus, etc.

- Point -

Chlorine dioxide has strong disinfecting and inactivating effects on various microorganisms, such as bacteria, fungi (mold), and viruses.

**(ii) Bactericidal effects on various bacteria and fungi (Part 1):** Minimum bactericidal concentration (MBC) (ppm)

Bacterial species	Agents	Chlorine dioxide	Sodium hypochlorite
<b>E. coli</b>		1	10
<b>S. aureus</b>		1	10
<b>MRSA</b>		1	10
<b>B. subtilis spore</b>		100	>1,000
<b>A. niger</b>		10	1,000

Source: Takayama et al., Journal of Antibacterial and Antifungal Agents, Vol. 23, No. 7, p401-406 (1995), data of 2.5-minute liquid contact

**(iii) Bactericidal effects on various bacteria and fungi (Part 2): Minimum bactericidal concentration (MBC) (ppm)**

Bacterial species	Liquid contact time	
	2.5 minutes	15 minutes
<i>P. aeruginosa</i>	10	1
<i>S. gallinarum</i>	1	0.1
<i>V. parahaemolyticus</i>	1	0.1
<i>S. faecalis</i>	10	1
<i>L. plantarum</i>	1	1
<i>B. cereus</i> var. <i>mycoides</i>	1,000	100
<i>C. sporogenes</i>	100	10
<i>P. citrinum</i>	10	10
<i>C. cladosporioides</i>	10	10
<i>F. solani</i>	10	1
<i>R. oryzae</i>	10	10

Source: Takayama et al., Journal of Antibacterial and Antifungal Agents, Vol. 23, No. 7, p401-406 (1995)

- Point of results (ii) and (iii) -

Chlorine dioxide has strong disinfecting effects on various bacteria and fungi.

**(iv) Comparison of properties between stabilized chlorine dioxide and sodium hypochlorite**

Properties	Stabilized chlorine dioxide	Sodium hypochlorite
Mechanism of action (sterilizing and deodorizing effects)	Oxidative activity of free oxygen radicals in chlorine dioxide.	Oxidative and chlorination activities of hypochlorous acid].
Efficacy	<b>Stronger instantaneous effects than sodium hypochlorite: 2.6-fold higher oxidative activity than chlorine and 10-100-fold stronger instantaneous effects.</b>	Highly effective although inferior to chlorine dioxide.
Effective pH range	<b>Broad (pH 1-10).</b>	Narrow (reduced effects at alkaline pH).
By-products	<b>No harmful trihalomethane is generated.</b>	Harmful trihalomethane is generated (chlorination effects).
Effects of coexisting substances	<b>Effects are hardly reduced by coexisting ammonia and organic substances.</b>	Effects are reduced by coexisting ammonia and proteins.
Storage stability	<b>Excellent.</b>	Effects decrease over time ...Active ingredient is likely to decrease.
Handling properties	<b>Relatively easy and less odor</b>	Strongly alkaline stock solution
Price	Slightly expensive.	Inexpensive



## 4. Evaluation of Cleanbay Air

### 1) Bactericidal effects of Cleanbay Air (mist)

Bacteria	Test objects	Viable bacteria count/mL		
		Start	1 minute	5 minutes
<b>S. aureus</b>	Sample	$(5.5 \times 10^5)$	<10	<10
	Control	$5.5 \times 10^5$	-	$5.4 \times 10^5$
<b>E. coli</b>	Sample	$(5.2 \times 10^5)$	<10	<10
	Control	$5.2 \times 10^5$	-	$5.3 \times 10^5$
<b>P. aeruginosa</b>	Sample	$(4.8 \times 10^5)$	<10	<10
	Control	$4.8 \times 10^5$	-	$4.9 \times 10^5$
<b>Salmonella</b>	Sample	$(2.4 \times 10^5)$	<10	<10
	Control	$2.4 \times 10^5$	-	$2.5 \times 10^5$

Note) Sample: Cleanbay Air (mist); Control: Purified water

Temperature of test solution: 25 °C, -: Not tested

Bacteria count at the start: The same number of bacteria as that under the same conditions as the control were plated.

<Point of results>

All the test bacteria were killed and reduced by 99.999% through short-time contact with Cleanbay Air (mist).

### 2) Measurements of chlorine dioxide (ClO<sub>2</sub>) generated from Cleanbay Air (gel)

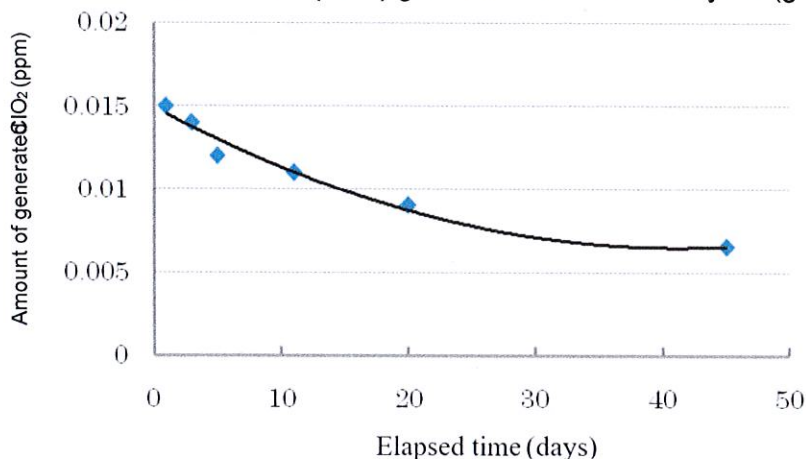


Figure 1. Relationship between elapsed time (days) after opening a container and the amount of sustained ClO<sub>2</sub> release

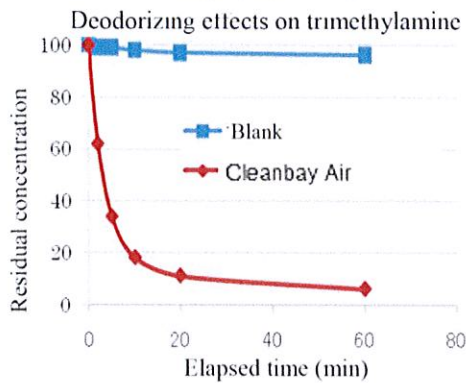
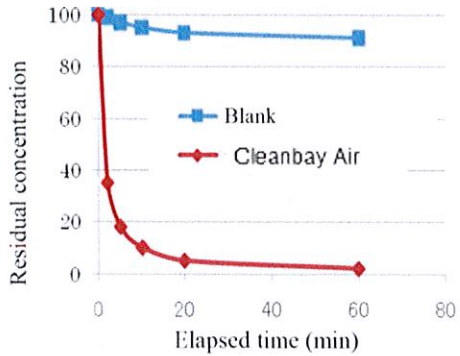
Note Measuring method: A gel container was opened in a small container (1.46 L). The amount of generated ClO<sub>2</sub> was indicated as the corresponding value of the amount of ClO<sub>2</sub> generated in a six-mat space (25 m<sup>3</sup>) within a day.

Measurement atmosphere: windless atmosphere at 21-25°C without humidity control

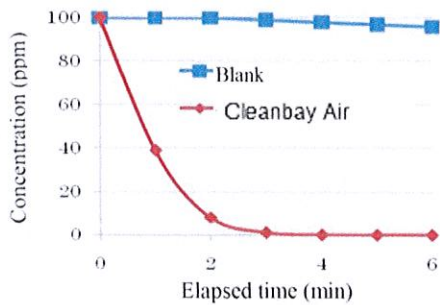
<Point of results>

The amount of sustained ClO<sub>2</sub> release gradually decreased over time. The effective sustained release continued for at least about 1.5 months.

### 3) Deodorizing effects of Cleanbay Air (gel)



#### Deodorizing effects on methyl mercaptan



#### Deodorizing effects on formaldehyde (Initial value: about 1 ppm)

Test method: Odorant gas was filled at a specific concentration in a 60-L container. The changes in the concentration (residual concentration percentage of the initial value) of odor substances were followed over time in the presence or absence of coexisting Cleanbay Air.

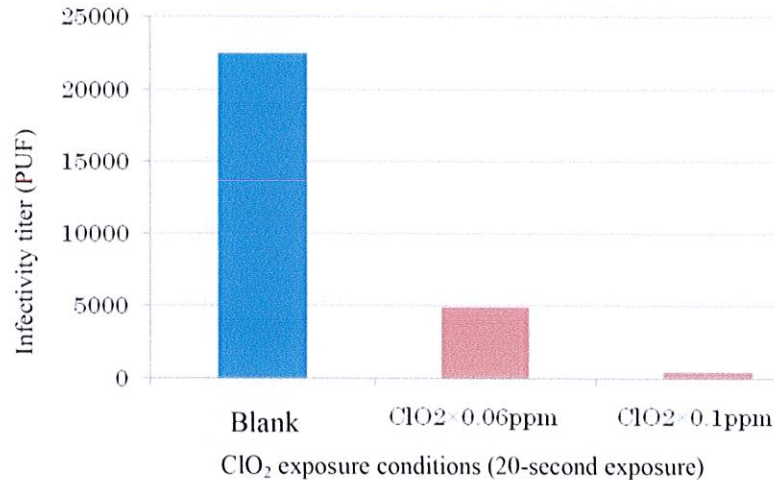
<Point of results>

Cleanbay Air (gel) was very effective for removing odor substances.



#### 4) Virus inactivating effects of Cleanbay Air

- Inactivating effects on influenza A virus (preliminary results) –



Relationship between ClO<sub>2</sub> exposure concentration and the infectivity titer of type A influenza virus

Test method: An air exposure test was conducted with ClO<sub>2</sub> gas exposure for 20 seconds.

<Points of results and discussion>

- i) The infectivity titer was significantly reduced by short-time exposure for 20 seconds.
- ii) As previously reported\*1), chlorine dioxide gas exposure at a low concentration of about 0.03 ppm was effective for preventing influenza A virus infection. Extended ClO<sub>2</sub> gas exposure at a concentration below that applied in the present test may reduce infectivity titer.

\*1) Norio Ogata, Takashi Shibata  
Journal of General Virology 2008 89 60~67  
Protective effect of Low-concentration chlorine dioxide gas against influenza A virus infection  
(Protective effect of low-concentration chlorine dioxide gas against influenza A virus infection)

# Q & A Regarding Cleanbay Air

## What is Cleanbay Air?

Cleanbay Air is a product which produces chlorine dioxide gas. It reduces virus, germs, bacteria, mold and bad odor.

## Does Cleanbay Air contain bleach? If so, how can these will be ok?

It doesn't contain a chlorine-based bleaching agent. Its active agent is  $\text{ClO}_2$ .

## Is Cleanbay Air compatible with other products?

The main function of the body is chlorine dioxide gas, therefore it is compatible with other products.

## How Cleanbay Air stabilize?

Stabilizes sodium nitrite with alkali metal salt.

## What are the key benefits of Cleanbay Air?

The key benefits of Cleanbay Air are disinfection and deodorization.

## Is Cleanbay Air used in wound cure? What kind of wound?

Since they are not Pharmaceuticals and Medical Products, they cannot be used in wound cure.

## How Cleanbay Air used?

Spray type: Spray on concerned areas  
Gel/: Remove film and place on flat surface.

## What is the active element in Cleanbay Air?

The active element in Cleanbay Air is chlorine dioxide gas.

## What is the PH of Cleanbay Air?

PH of gel type is 5- 6.  
PH of type is 10- 11.

## Does Cleanbay Air have any toxicity?

It doesn't contain any toxicity.

## What the safety level does Cleanbay Air have?

The safety level of chlorine dioxide gas is confirmed by FDA and USDA.  
JFCFA of WHO and FAO has also confirmed its safety.

## Cleanbay Air currently have any approvals from any countries?

They are not approved in any countries yet.



### How frequently can Cleanbay Air be used?

According to EPA in America, chlorine dioxide gas can be used under the following conditions.

ACCGIH TLV- TWA 0.1ppm (0.28mg/m<sup>3</sup>) 8 hours exposure limit  
TLV- STEL 0.3ppm (0.83mg/m<sup>3</sup>) 15minutes exposure limit

### What is the recommended dose?

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TLV- STEL 0.3ppm (0.83mg/m<sup>3</sup>) 15minutes exposure limit

### Is Cleanbay Air classified sterile agent?

They are not pharmaceuticals and medical products, however, it is approved as sterilizer by the MOH.

### What is the shelf life of Cleanbay Air?

The shelf life of Gel/ Cleanbay Air is as follows. Once it's opened, it lasts for about 1 month.

### How Cleanbay Air stored?

Avoid direct sunlight and store in a cool area.

### Does Cleanbay Air sensitive to heat or cold?

Gel type is sensitive to freezing temperature.

### Is there any count indication for Cleanbay Air?

Avoid using in enclosed space.

### How long does it take for Cleanbay Air to be effective?

Once gel/ type is opened, they are effective for about a month.

### Does Cleanbay Air evaporate after working on the wound?

Since they are not pharmaceuticals and medical products, they cannot be used on the wound.

### Does Cleanbay Air have any disposal requirement?

The content of Cleanbay Air will be disposed of as non- inflammable.

What microorganism is Cleanbay Air effective against?

They are effective against bacteria, virus, mold, etc.

Does Cleanbay Air damage tissues?

It doesn't damage tissues.

Does Cleanbay Air induce mutagenicity?

They do not induce mutagenicity.

Are there any side effects or known allergy/sensitivity to Cleanbay Air?

There are no side effects reported.

How is Cleanbay Air different from other super-oxidized products?

Super-oxidized is free radical, on the other hand, Cleanbay Air is not.

Does Cleanbay Air damage DNA in fibroblast or wound?

Cleanbay Air does not damage DNA in fibroblast or wound.

How is Cleanbay Air different from Dakins (Antiseptic, Sodium Hypochlorite)?

Sterilizing power of chlorine dioxide is more effective than sodium hypochlorite. chlorine dioxide doesn't create toxicities including trihalomethane.

How is Cleanbay Air different from Hibic Lens (Chlorhexidine products)?

Sterilizing power and bactericidal rate of chlorine dioxide is more effective than chlorhexidine products

How is Cleanbay Air different from the silver solution?

Antibacterial activity of the silver solution is by Ag ion. Chlorine dioxide gas works by oxidation action.

Does ClO<sup>2</sup> reach to toxic level when Air Doctor used by hospital staff, if all using Air Doctor at the same time, say 5,000 staff in the same hospital?

It depends on the spatial region, however, it is assumed not to reach to the toxic level.

In case spray purifier used, can purifier use also at the same time?

There are no problems in particular.



### What is the distance to maintain Cleanbay Air effective against viruses?

Cleanbay Air is effective within 1m<sup>3</sup>.

However, cannot guarantee its effectiveness in the open air.

### Any evidence about distance effectiveness of viral blocking?

We are currently examining against killed bacteria and virus.

### Does Cleanbay Air affect virus, like Corona?

Chlorine dioxide is tested against para- virus and it's effective.

### Any studies on Cleanbay Air against viruses?

Chlorine dioxide is tested against many viruses and there are many documents exist about the effectiveness of chlorine dioxide.

### Does Cleanbay Air have FDA approval?

Cleanbay Air does not have FDA approval.

### Any warning against the use of ClO<sub>2</sub> from FDA or WHO.

According to FDA or WHO, chlorine dioxide should be used under the following conditions.

ACCGIH TLV- TWA 0.1ppm (0.28mg/m<sup>3</sup>) 8 hours exposure limit

TLV- STEL 0.3ppm (0.83mg/m<sup>3</sup>) 15minutes exposure limit

### Is Cleanbay Air registered in Japan like Japanese Food & Drug Administration or Agriculture?

Cleanbay Air is considered as general good, therefore it doesn't need to be registered in Japan under the Japanese law.

### Do you have any gas form of ClO<sub>2</sub> as a disinfectant?

We currently do not carry spray type, however, it is possible to produce such products. However, it requires certain MOQ.

### Does Cleanbay Air have any registrations in Europe, USA & Asia? Which country?

Cleanbay Air does not have any registrations in other countries yet.

### Does Cleanbay Air effective against respiratory infection, either bacterial or viral?

Chlorine dioxide is also effective against flu.



How long the Cleanbay Air maintains effectiveness once opened/used?

Once it is opened, it lasts for about a month.

How frequently we need to change the Cleanbay Air ?

Cleanbay Air gel/ lasts for about a month once it is opened.

Do you have any presentation in English about Cleanbay Air Technical Data, Effectiveness or any other details, which is important to customers?

We will provide you with some English presentation of chlorine dioxide.

