



**DON'T TREAT THE SYMPTOMS.  
CURE THE CAUSE.**

**[www.gardnclean.com](http://www.gardnclean.com)**

# I N T R O D U C I N G PURE CHLORINE DIOXIDE

The newest technology in disinfection and  
odor elimination

As innovators in antimicrobial solutions, Gard'nClean® brings you the world's most versatile and user-friendly choice for surface disinfection, sanitization and space deodorization.

This easy to use, just-add-water patented delivery system offers a more intelligent and environmentally sophisticated method for decontamination.



## WHY HAVEN'T I HEARD OF THIS BEFORE?

Until recently, Chlorine Dioxide generation required large mechanical equipment that came at a huge expense. Gard'nClean® and its patented just-add-water technology requires only tap water to generate pure chlorine dioxide on-site. No hazardous by-products, no expensive infrastructure to purchase and maintain, and no special certifications.

## The Story of ClO<sub>2</sub>



The original or "stabilized" version of chlorine dioxide is made from precursor chemicals mixed together, creating low concentrations of ClO<sub>2</sub> but also many harmful chlorinated by-products including toxic and corrosive chlorates.



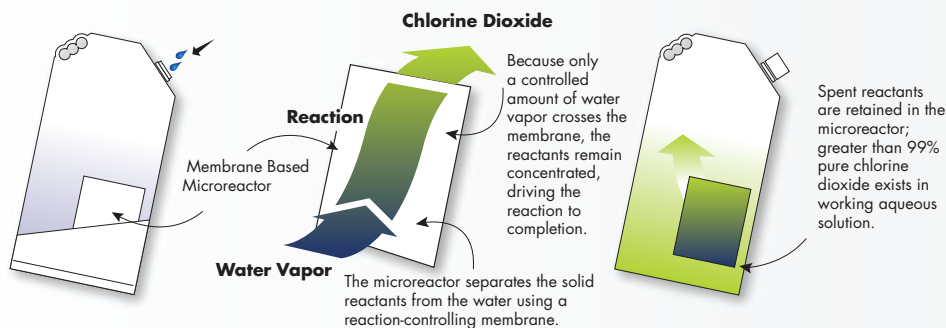
Then, chlorine dioxide generators were utilized to create a better concentration of ClO<sub>2</sub>. These generators are expensive, not mobile and require trained personnel. Corrosive chlorinated by-products remain a concern.



Today, Gard'nClean® and its patented ClO<sub>2</sub> technology is available, allowing for ultra 99.9% pure chlorine dioxide that's ready to use. It requires no special training, is portable and safe.

The purity of Gard'nClean® makes it ideal for cultivation and processing facilities; food preparation, agriculture, crop transportation & storage, as well as general disinfection and deodorization.

### MICROREACTOR TECHNOLOGY — HOW IT WORKS



**Contact us** to make a custom protocol for your cleaning and disinfecting needs.





**More efficient, safer and effective than bleach!**

Introducing the newest technology in disinfecting and odor elimination from the innovators in microbial solutions.

## What are the benefits of 99.9% pure chlorine dioxide?

### It's **EFFECTIVE**

99.9% pure  $\text{ClO}_2$  is an oxidizer — plant pathogens are unable to build up a tolerance. It is effective against wide varieties of dangerous microorganisms including:

- germs
- viruses
- fungi
- spores
- mold & mildew
- bacteria

### It's **GENTLE**

Unlike other disinfectants, there are no corrosion concerns at use levels.  $\text{ClO}_2$  can be used on food, water and in food preparation areas.

### It's 99.9% **PURE**

Our technology is eco-friendly and OMRI organic certified, requiring no special disposal or handling requirements. The activated solution has a neutral pH.

Germes and bacteria are not able to build up resistance to  $\text{ClO}_2$  because it attacks through oxidation.

**Smarter  
than  
Bleach**

Pure  $\text{ClO}_2$

**Pure chlorine  
dioxide** is a  
**superior  
solution** to bleach.

## Why are Gard'nClean®'s products so pure?

It is because of our patented technology. Simply put, the chemical reaction that generates chlorine dioxide generates harmful by-products. Gard'nClean® traps the harmful by-products in a proprietary membrane until the reaction is complete, so only the chlorine dioxide molecule is released into the solution, resulting in **negligible** and **lower corrosiveness**.



# Gard'nClean®

HIGH PURITY CHLORINE DIOXIDE AT THE POINT OF USE

## BIOCIDAL EFFICACY

BIOCIDE	OZONE $O_2$	PEROXIDE $H_2O_2$	SODIUM HYPOCHLORITE (NaOCl)	Gard'nClean® <small>HIGH PURITY CHLORINE DIOXIDE AT THE POINT OF USE</small>
1.49	2.07	1.78	1.49	.95
2e-	2e-	2e-	2e-	5e-

Oxidation capacity illustrates strength to attract electrons; higher oxidation capacity signifies greater ability to eliminate more pathogens using less disinfection concentration.

## DISINFECTION CONCENTRATION

Tested in a 5-log reduction after 60 seconds | Test Organism: Staphylococcus aureus

	Concentration (ppm)
CHLORINE COMPOUND 1 (Sodium hypochlorite)	1000
CHLORINE COMPOUND 2 (Stabilized chlorine dioxide)	1200
IODOPHUR	440
PEROXIDE	68000
GLUTARALDEHYDE-PHENOL	1200
ACID GLUTARALDEHYDE	2200
ACIDIFIED QUAT	1200
PHENOLIC	380
PERACETIC ACID	400
Gard'nClean® <small>HIGH PURITY CHLORINE DIOXIDE AT THE POINT OF USE</small>	5

## FACT SHEET



### What is Gard'nClean® 99.9% ultra-pure chlorine dioxide?

It is the world's most user friendly, point-of-use (just add water) highly effective biocide for environmental sanitation.

### Why use Gard'nClean® instead of chlorine or similar compound?

Gard'nClean® 99.9% pure chlorine dioxide is not corrosive to infrastructure, does not create the same toxic compounds, and removes bioslimes and other pathogens at much lower concentrations than similar compounds.

- 1) Gard'nClean® ultra-pure chlorine dioxide delivers greater than 99.9% pure chlorine dioxide and without unwanted oxychloro species; Gard'nClean® is better than chlorine due of the following:
  - a. **Negligible toxicity**
  - b. **Superior material compatibility** (kills the pathogens, not your equipment)
- 2) **Chlorine dioxide** is the world's **most powerful** and **versatile biocide**; it retains its chemical characteristics in both air and water and has an ability to kill more pathogens with less concentration (much less) than any form of chlorine
- 3) Ability to remove **bioslime even at low concentrations**
  - a. Due to its inherent selectivity, neutral charge, and neutral pH, Gard'nClean® 99.9% ultra-pure chlorine dioxide is able to attack bioslime from the inside out (other products simply focus on surface layers of bioslime)
- 4) **Ease of use** – just add water, wait, and fully decontaminate! No additional activators are necessary.

## FACT SHEET



### What is **chlorine**?

Chlorine is a disinfectant that is available in many forms. These forms include:

Chlorine gas, sodium hypochlorite "bleach" & calcium hypochlorite HTH tablets / granules, *and* organo-chloro compounds which can release chlorine on contact with water.

Regardless of the form of chlorine, the disinfecting agent is hypochlorous acid, which is **pH dependent** for microbial efficacy.

### Why use **chlorine**?

It is a strong oxidizer with end-user familiarity. It is very cost effective.

What are some of the current options or respective forms?

- 1) **Gayden Dlo** is a 0.7% sodium hypochlorite solution
- 2) **Klorfasil** or granulated tablets
- 3) **Dlo lavi** is a 0.94% sodium hypochlorite
- 4) **Aquatabs** is sodium dichloroisocyanurate that dissolves into solution to release hypochlorous acid

We don't use chlorine or related compounds due to safety or especially because it is more effective, we use it because it generally costs the least

### WHAT ARE THE **DISADVANTAGES** OF USING TRADITIONAL **CHLORINE** OR SIMILAR COMPOUNDS?

**A) Highly corrosive** (all forms); free chlorine and chlorite will likely be present

**B) Highly toxic** (all forms); due to its volatility, the biggest cause for concern when using a chlorine compound is the formation of carcinogens (cancer causing agents);

- a. A study by the U.S. Council of Environmental Quality showed that the **cancer risk** among people **drinking chlorinated water is 93% higher** than among those whose water does not contain chlorine.

**C) Inability to efficiently remove bioslime** at low concentrations; bioslime is the 'home' for microbe colony forming units (CFUs)

**D) Changes odor and taste of food stuffs** when used in food processing and/or water purification applications

**E) Currently banned substances**, such as **DDT and PCBs**, have a distinct similarity: **chlorine**

## QUICK REFERENCE



Pure (and only pure) chlorine dioxide offers many benefits from other common and well-known disinfectants. Unlike stabilized (dirty) chlorine dioxide, bleach and acids, pure chlorine dioxide from Gard'nClean®, is far more powerful and offers much greater efficacy. Even with all of its power, pure chlorine dioxide demonstrates a negligible toxicity profile. Aside from highly efficacious mold remediation and attendant deodorization, the biggest differences you will get with use of Gard'nClean® and its patented, pure chlorine dioxide technology, especially as measured against many commonly known disinfection products, are **the following benefits:**

### **Pure ClO<sub>2</sub> is many times more powerful than bleach as a disinfectant and sanitizer**

### **Pure ClO<sub>2</sub> is non-corrosive as compared to bleach or other disinfectants**

- Pure ClO<sub>2</sub> is not a dermal sensitizer
- Pure ClO<sub>2</sub> may be used on food, water and food preparation surfaces

### **Pure ClO<sub>2</sub> is a very powerful oxidizer so germs and bacteria are unable to build up tolerance**

### **Pure ClO<sub>2</sub> is effective against wide varieties of dangerous microorganisms:**

- Germs
- Viruses
- Spores
- Molds and fungi
- Bacteria (gram negative and gram positive bacteria)

### **Pure ClO<sub>2</sub> from Gard'nClean® is easy to use**

- Just add water
- Spray and walk away
- Offers superior material compatibility
- Pour any unused solution down any drain
- Throw used packages in any trash receptacle
- No special handling or disposal training necessary

### **Pure ClO<sub>2</sub> is also a powerful deodorizer**

- Pure ClO<sub>2</sub> has higher kill capacity as compared to any other major oxidizer (2.5x)
- Pure ClO<sub>2</sub> offers superior ability to remove bio-slime
- Gas phase and aqueous application

These are just a few of the benefits of Pure ClO<sub>2</sub> from Gard'nClean®. Our products are recognized and listed by the FDA, the EPA and OMRI (Organic Materials Review Institute). For more information please visit our website [www.gardnclean.com](http://www.gardnclean.com)





# Competitive Advantages of PURE CHLORINE DIOXIDE

## Pure Chlorine Dioxide vs. acidified sodium chlorite

Chlorine dioxide ( $\text{ClO}_2$ ) is a highly versatile and highly compatible gas molecule that retains its chemical characteristics in both air and water, and it is widely used in many industries as a decontaminating agent. Unlike chlorine gas, chlorine dioxide does not hydrolyze in water to form ionic impurities, nor does chlorine dioxide form harmful byproducts, like chlorine bleach. As many products claim to generate pure chlorine dioxide probably due, it is important to differentiate use of ultra-pure chlorine dioxide and acidified sodium chlorite (a.k.a. stabilized chlorine dioxide or impure chlorine dioxide). Stabilized chlorine dioxide products yield very little to zero actual chlorine dioxide, and instead deliver vast amounts of corrosive oxychloro species, chlorites and chlorates. Ultra-pure chlorine dioxide solutions are superior at removing bio-slime and cleaning head space (unwetted surfaces), while also rinsing away from lines, tanks, and distributions systems in only one flush. Gard'nClean® ultra-pure chlorine dioxide at the point of use, offers a very user-friendly (just add water), highly compatible, and environmentally-aware method to harness the decontamination power of the  $\text{ClO}_2$  molecule. This is accomplished through its patented membrane technology, which permits a true gas exchange, and delivers >99% pure chlorine dioxide in solution.

It is important to distinguish between pure or nearly-pure solutions of chlorine dioxide, including Gard'nClean® line of products, and the acidified sodium chlorite products on the market sold under various names including "stabilized chlorine dioxide" or acidified sodium chlorite.

To illustrate the differences between pure chlorine dioxide and acidified sodium chlorite, generated solutions using the product of a leading supplier of the stabilized chlorine dioxide formulations and compared it to a solution of Gard'nClean® ultra-pure chlorine dioxide. The stabilized solution was activated using citric acid, as per the manufacturer's directions. The key results are presented in the chart on the right.

Chlorine dioxide	"Stabilized"	Gard'nClean®
Amount of $\text{ClO}_2$ generated	3.2 ppm	75 ppm
Chlorite ( $\text{ClO}_2^-$ ) level 1	34.0 ppm	0.6ppm
Chlorate ( $\text{ClO}_3^-$ ) level	3.0 ppm	0.2ppm
Final pH	3.04 (acidic)	6.9(neutral)
% Pure $\text{ClO}_2$	2.3%	99.9%

Typical of acidified sodium chlorite formulations, this particular product included high concentrations of chlorite and chlorate compounds, a low conversion rate to chlorine dioxide, and an acidic pH. The large background of oxidizing ionic species (chlorites, chlorates) coupled with the low pH are reasons why stabilized solutions generally have material compatibility issues and are virtually ineffective at cleaning head space and removing bio-slime. This is not true of Gard'nClean® pure chlorine dioxide where application and product usage are vast and superior to other leading disinfection and deodorization methods.

## Chlorine Dioxide vs. chlorine (bleach)

Gard'nClean® products include safe generation of pure chlorine dioxide at the point-of-use. Only tap water needs to be added to advanced micro-reactor sachet technology in order to generate ultra-pure chlorine dioxide. This results in specific concentrations of chlorine dioxide without corrosive residuals and at a neutral pH.

**What is Chlorine?** Chlorine comes in a number of forms\*:

- Chlorine gas
- Sodium hypochlorite "bleach" & calcium hypochlorite HTH tablets/granules
- Organo chloro compounds which can release chlorine on contact with water; eg dichlorodisocyanurate

*\*Regardless of the form of chlorine, the disinfecting agent is hypochlorous acid (HOCl)*

### Advantages of $\text{ClO}_2$

- Strong oxidizer
- End-user familiarity
- Cost effective disinfectant

### Disadvantages of Bleach

- It is highly corrosive (in all forms)
- It is very weak at removing bioslime
- It's efficacy against microbial organisms is very pH dependent (see chart on right)
  - It produces an unpleasant working environment due to potential health hazards
- It is highly reactive and hence affected by suspended solids and organics in water
- It is toxic (in all forms); HOCl can produce disinfection byproducts, which are carcinogenic
- It is important to know the difference between "free" chlorine and "combined" chlorine. Free chlorine relates to

HOCl in the pH range of 7 – 7.5 and combined chlorine relates to the OCL<sup>-</sup> ion or reaction solutions, e.g., chloramines. The latter (OCL<sup>-</sup> and chloramines) have VERY POOR disinfectant capabilities.

pH	% HOCl PRESENT IN WATER
6.0	100
7.0	75
7.5	50
8.0	24
8.5	9
9.0	3