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CHLORINE DIOXIDE
QUESTIONS & ANSWERS

Is Chlorine Dioxide (ClO_2) the same as Chlorine gas (Cl_2)

or Sodium Hypochlorite / Bleach ($NaOCl_2$)

or electronically generated hypochlorite (Electro-chemical activation – ECA)?

No. While chlorine dioxide has chlorine in its name, its chemistry is dramatically different from chlorine or sodium hypochlorite. One of the most important properties of chlorine dioxide that sets it apart from other chlorine species is its behavior when placed in water. Chlorine / bleach / or solutions produced through electro-chemical activation (ECA) hydrolyze, or react, when placed in water to form hypochlorous and hydrochloric acids. Chlorine dioxide does not hydrolyze and remains a truly dissolved gas in water. Chlorine is an effective biocide only in systems where pH is less than 8. Sodium hypochlorite is effective in systems where the pH is greater than 8, whereas chlorine dioxide retains its useful oxidative and biocidal properties throughout a broad pH range (2 to 12 pH). Chlorine dioxide has a lower oxidative potential than chlorine but has **2.5** times the capacity, and **100** times the capacity of sodium hypochlorite, making it a more effective disinfectant. Additionally, chlorine dioxide does not chlorinate organics to form disinfection by-products such as THMs and HAAs.

Measurement of Oxidizing Agent ORP Values In Pathogen Disinfection*

OXIDIZING AGENT	OXIDIZING AGENT ORP VALUE RANGE (mV)
CHLORINE DIOXIDE (CLO_2)	600 → 1000 MV
OZONE* (O_2)	700 → 1000 MV
IODOPHORS (I_2)	400 → 600 MV
HYDROGEN PEROXIDE	300 → 500 MV
SODIUM HYPOCHLORITE	250 → 500 MV

*Ozone is greatly influenced by the water quality and ozonation system.

Table 1. provides the oxidizing (disinfecting) range of the most popular sanitizing agents in the industry. The higher the Oxidation Reduction Potential (ORP), the higher the disinfecting ability. This is measured in millivolts (mV).

Can I purchase chlorine dioxide in package containers?

No. Chlorine dioxide cannot be compressed like chlorine gas and must be produced at the point of application. Chlorine dioxide is "produced" from a two-part, base and activator system. Chlorine dioxide can be produced on-site using simple mixing instructions, or with automated equipment created to specifically mix the base and activator components. The use of chlorine dioxide in low dosage applications makes on-site generation actually desirable as it minimizes packaging, storage and transportation costs associated with the majority of application specific chemicals.

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Is chlorine dioxide safe for use in animal and agricultural applications?

Chlorine dioxide has been used safely in industrial and municipal water treatment applications for more than 70 years. It is being used in a growing number of agricultural hygiene applications due to its highly selective oxidizing properties, which result in a lower dosage requirement. Chlorine dioxide has gained wide acceptance in the animal agricultural market sector for uses in animal and facility hygiene, water treatment and even sand / bedding treatments. Like many products used for hygiene purposes, there are safety considerations when using chlorine dioxide. However, Acepsis works closely with its partners, who are provided training and understanding of the chlorine dioxide chemistry. The knowledgeable partners are critical in the selection of its applications and have experience with applications in the field, which allow for a safe and effective chlorine dioxide treatment programs.

Where is chlorine dioxide typically used?

Chlorine dioxide is used in municipal water plants to disinfect potable water and in wastewater treatment plants for oxidation and odor control. It is used in food and beverage plants for hard surface sanitation and fruit and vegetable processing. It is also used in cooling towers and hospitals for legionella control, rendering plants for odor control, and in oil and gas water treatment as a biocide, among other common uses. Chlorine dioxide has been used for more than 30 years in pre- and post-milking hygiene applications. In many instances, chlorine dioxide is replacing iodine in teat dips, chlorine gas or bleach to meet higher performance standards or regulatory requirements. Chlorine dioxide is used to disinfect potable water around the world and is approved for use by the Environmental Protection Agency (EPA) and the World Health Organization (WHO).

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Is it complicated to produce chlorine dioxide on site?

No. Chlorine dioxide can be produced in low volumes with simple mixing instructions. It can be automatically produced using equipment specifically designed to the individual on-site hygiene applications. The process is simple enough for general operations, and automation can simplify operations further. Chlorine dioxide allows for precise, customized treatment with options for data gathering and remote operation. By ensuring proper equipment design and training of personnel, effective treatment can be ensured.

How does chlorine dioxide work and can bacteria become resistant to it?

No. Chlorine dioxide kills bacteria by attacking their critical cell physiological functions, including the disruption of protein synthesis. It also alters the permeability of the outer cell membrane. Chlorine dioxide diffuses through the protective layer of the cell and inactivates pathogens from the inside out. It prohibits both anaerobic and aerobic type's of bacteria from developing resistance and eliminates the need to alternate biocide treatments. Sulfate-reducing bacteria (SRBs) and acid-producing bacteria (APBs) are especially vulnerable to chlorine dioxide oxidation. Not only is chlorine dioxide an effective biocide, its oxidizing properties will also destroy hydrogen sulfide (H_2S) and iron sulfide (FeS) contaminants in water systems.

Can chlorine dioxide be generated from simple salt electrolysis?

No. Salt electrolysis, or electro-chemical activation (ECA) produced in an undivided electrochemical cell leads exclusively to the production of sodium hypochlorite. It is currently commercially impossible to produce measurable quantities of chlorine dioxide from simple brine electrolysis. For the sake of simplicity, Acepsis products produce chlorine dioxide via the mixing of an acidic medium (Activator) with a sodium chlorite solution (Base). Acepsis products are specifically formulated for required applications. These products can be mixed in small quantities, manually, or by using automated mixing and applications devices.

For more information, call Acepsis™ or your local representative.

ACEPSIS™, LLC is an animal health based company that is focused on the development of state-of-the-art animal hygiene technologies. Our Company's mission is to apply innovative animal hygiene technologies into the agricultural and veterinary market sectors.

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