Powered by HOCl

Interesting Facts about Hypochlorous Acid

From the makers of Disinfexol®

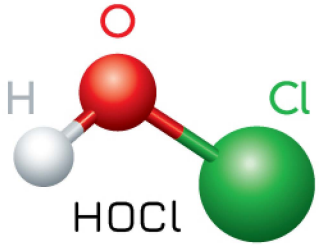
Gil Lovett & Ken Lovett
Co-Directors of Biz Dev, HOCl Markets
contact@disinfexol.com
Berkshire Corporation

April 2025

Table of Contents

The Nature of Hypochlorous Acid ("HOCl")

Hypochlorous Acid ("HOCl") is a wonder of nature, both inside and outside of the human body. It is a molecule composed of only three elements from the periodic table – hydrogen (H), oxygen (O) and chlorine (Cl).



H = Hydrogen
O = Oxygen
Cl = Chlorine

First and foremost, HOCl is an endogenous substance in all mammals. The body's immune system naturally produces HOCl to fight invading pathogens. Specifically, when our bodies detect infection, white blood cells, known as neutrophils and macrophagesas, produce HOCl with the help of the enzyme, myeloperoxidase, to defend against bacteria, viruses and fungi. HOCl is one of the body's natural protective responses to keep us healthy and free from disease.

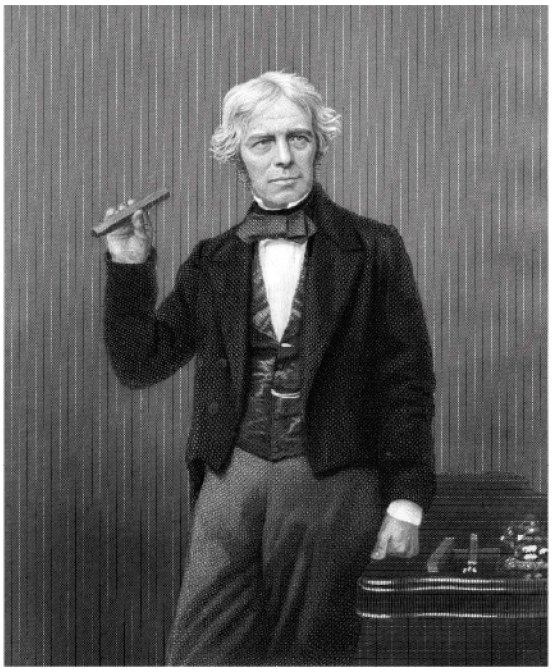
Outside of the body, HOCl was first used during WWI., Because it maintains the perfect balance between safety and efficacy, it has played a crucial role in ensuring safe drinking water, clean swimming pools, hard-surface disinfecting and even cosmetic and wound treatment, among other applications. HOCl is safe for humans and animals, is non-toxic and carries a pH between 4-6, which is nearly identical to that of our skin.

History of HOCl

Though many people still don't know much about HOCl, it has a long and storied history, dating back to the early 1800s.

In 1811, it was identified by Sir Humphry Davy as a substance produced by the body to fight infection, but it was not known on what principle this action was based.

In 1823, Michael Faraday succeeded in isolating hypochlorous acid by electrolysis.



Scientist, Michael Faraday

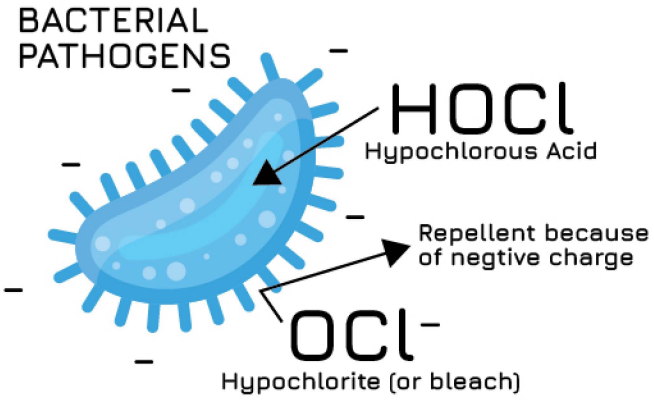
In 1834, the French chemist, Antoine Jérôme Balard, created HOCl by adding to a flask of chlorine gas a dilute suspension of mercury(II) oxide in water. He also named the acid and its compounds.

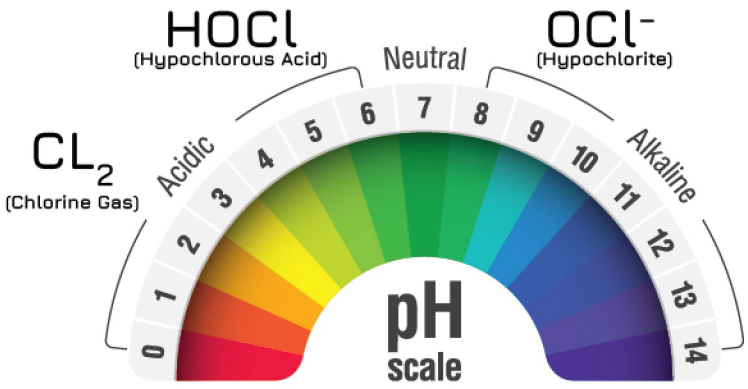
HOCl has long been identified and known by scientists for its extraordinary ability to kill harmful pathogens and prevent disease, yet an efficient method to produce stable HOCl, and in large scale, remained elusive until recently. Modern production systems, through a process called electrolysis, have since offered solutions to these challenges. It is important to note, however, that there are different production processes, materials, stability and quality levels of HOCl

How HOCl Works

HOCl is a weak acid, the solution of which typically possess a pH of 4-6. It has a neutral charge, which means it has a greater affinity towards net negatively charged bacteria on surfaces, causing them to drop their defenses. It is an oxidizing agent and a known electron "stealer". As such, once inside the cell, HOCl will disrupt the cell structure of pathogens by reacting with proteins, lipids and nucleic acids within cells, ultimately destroying them.

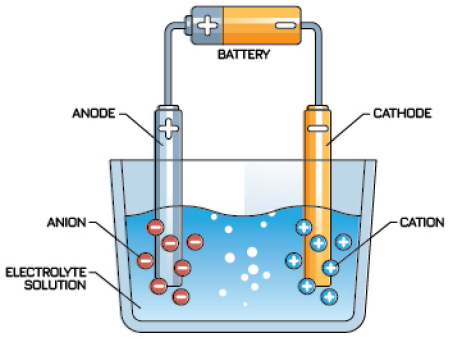
HOCl, due to its lower pH and neutral charge, is 80-100 times more effective at killing some pathogens than OCl^-. Hypochlorite (OCl^-), unlike HOCl, is an ion and carries a negative electrical charge and is therefore more likely to be repelled by the pathogen. The higher alkaline pH of OCl^- also makes it less safe than HOCl.





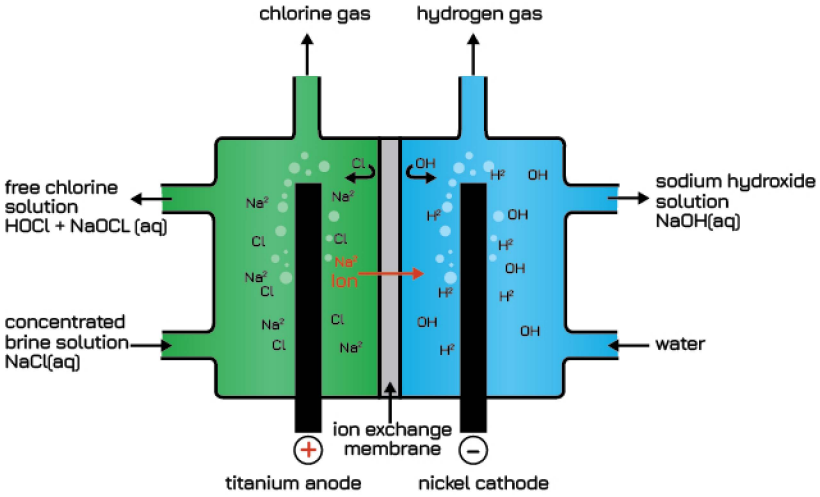
How HOCl is Manufactured

HOCl is generally manufactured with electrolysis, where electric current is passed through a solution of water (H_20) and sodium chloride (NaCl), resulting in an exchange of ions and, ultimately, HOCl.



The two primary methods used are (1) membrane cell and (2) single cell.

Membrane cell involves anode and cathode compartments that are separated by a permeable membrane. This process produces a purer and more stable HOCl. Single Cell does not separate the two chambers and may, or may not, use a membrane.



Anolyte and catholyte solutions are created when the electrochemical activation (ECA) generator uses an electrolyzer (cell) to activate a common salt solution. A diaphragm or membrane separates the two solutions into a positive anode chamber and a negative cathode chamber, each having an electrode. A direct electrical current passes through the solution creating the anolyte and catholyte solutions in their respective chambers.

The basic principle behind the ECA of water is electrolysis. Electrolysis is when liquids or solutions are transformed into oxidized or reduced forms by applying an electric current. The solution coming from the anode has oxidizing and disinfecting properties, while the catholyte solutions are high-alkaline and often used for cleaning purposes.

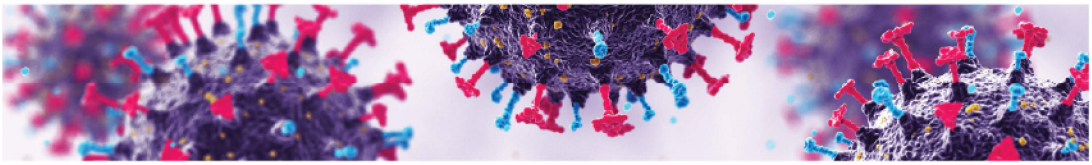
Efficacy of HOCl

Efficacy Against Different Pathogens

HOCl demonstrates broad-spectrum efficacy against various pathogens including bacteria, viruses, and fungi. It effectively targets both gram-positive and gram-negative bacteria by disrupting their cellular components.

Specific Claims

Studies and testing results by independent labs, scientific journals, and governmental registrations, such as the EPA, include:



BACTERIA

Acinetobacter baumannii
Bacteroides fragilis
Bordetella bronchiseptica
Clostridium Difficile (C. Diff)
Corynebacterium diphtherieae
CRE
Enterobacter aerogenes
Enterococcus species (VRE)
Escherichia coli (0157)
Haemophilus influenzae
Helicobacter pylori
Herpes Simplex Virus
Klebsiella pneumonia
Klebsiella oxytoca
Legionella pneumophila
Listeria monocytogenes (Listeria)
Methicillin Staphylococcus aureus (MRSA)
Micrococcus Luteus
Mycobacterium avium-intracellulare
Mycobacterium bovis (TB)
Mycobacterium chelonae
Mycobacterium smegmatis
Mycobacterium terrae
Mycobacterium tuberculosis (TB)
Mycobacterium xenopi
Proteus mirabilus
Pseudomonas aeruginosa
Salmonella enterica (Salmonella)
Serratia marcescens
Staphylococcus aureus (Staph)
Staphylococcus pyogenes
Streptococcus pneumonia
Vancomycin Resistant Enterococcus (VRE)
Vibrio vulnificus

VIRUSES

Adenovirus type 1 & 4
Avian Influenza H5N1
Bacteriophage MS2
Canine Distemper
Canine Parvovirus
Feline Calicivirus
Hepatitis A&B (HAV)
Herpes virus type 1
HIV-1
HPV
Human Coronovirus, Strain 229E
Human Norovirus (Norwalk)
Influenza including H1N1, HSN1 and H7N9
MS2 virus
Norovirus (Human and Murine)
Orthopoxvirus
Poliovirus type 1 & 2
Respiratory Syncytial Virus (RSV)
Rhinovirus
SARS-COV-2
Rotavirus
Swine Flu Virus (H1N1)
Zygosaccharomices bailii

BLOODBORNE PATHOGENS

Human Immunodeficiency Virus Type 1

FUNGI

Aspergilus niger
Candida albicans
Malassezia furfur
Mildew - Erysiphales, Peronosporaceae
Mold - Ascomycota
Trichophyton mentagrophytes
Trichophyton interdigitale

Efficacy of HOCl

Limitations

While HOCl is effective against many types of bacteria and viruses, it has limitations when it comes to removing organic stains and residues. For example, stubborn food stains or certain types of oils may not be easily eliminated by HOCl alone. In such cases, additional cleaning agents or techniques may be required for optimal results.

Stability

In general, HOCl has a relatively short shelf life. It tends to decompose gradually over time, especially when exposed to heat, light, or air. This can result in reduced effectiveness of the solution. It is important to store HOCl properly in sealed containers, away from direct sunlight or extreme temperatures, to maintain its efficacy.

While it is possible to produce a highly stable HOCl product, very few manufacturers have the knowledge and ability to do so, especially on a larger scale. So, to avoid the stability problem, some businesses take the approach of producing HOCl on-site using specialized generators that control the concentration and pH level. This on-site approach, however, is not for everyone as it necessitates hands-on production expertise, applicable certifications and maintenance from trained staff.

Approvals & Studies of HOCl

HOCl has been evaluated by regulatory agencies and healthcare institutions, professional organizations, independent laboratories, and academic institutions in more than 50 countries. This inexhaustive list includes the National Institutes of Health (NIH), the World Health Organization (WHO), the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), the United States Department of Agriculture (USDA), the Cleveland Clinic, and journals from many fields of study including biochemistry, dermatology, dentistry, surgery and other areas of academia.

These studies have included applications such as sanitizing and disinfecting for non-porous surfaces, food contact sanitizing, agricultural, topical, oral, skin and wound treatment, fogging and aerosolization, and even pet care.

All of these studies are evidence of the benefits of HOCl, when applied in accordance with the label and in the appropriate parts per million (PPM) concentration for a given application.

*The use of the above logos is for informational purposes only and does not infer endorsement by any of these agencies.

HOCl vs. Others

When compared to other disinfectants commonly used in healthcare settings, HOCl offers several advantages.

First, and most importantly, it has the perfect balance between safety and efficacy. Many other solutions are either safe but not very effective, or unsafe, but extremely effective.

Second, HOCl, is non-toxic, non-irritating, and often achieves the lowest level (Category IV) on the EPA's acute toxicity scale. Unlike many chemical disinfectants that may cause harm or damage to equipment or materials, HOCl is generally compatible with a variety of surfaces, including many metals, plastics, and fabrics.

Third, most other disinfectants do not carry a neutral charge like HOCl, which makes it harder for them to attract negatively charged bacteria and penetrate and disrupt cell walls.

Fourth, HOCl leaves little to no residue on hard surfaces. Residues increase the opportunity for microbes to proliferate. Due to this, and its 100% degradability factor, HOCl is used in organic food production facilities.

The primary disinfectants that compete with HOCl are included in the chart on the following page. None of these alternatives comprise both efficacy and non-toxicity as well and as comprehensively as HOCl. In addition, none of them are an endogenous substance in all mammals, as is HOCl, which naturally fight infection.

HOCl vs. Others

Property	Hypochlorous Acid	Alcohol	Bleach	Peroxide	Quaternary Ammonium	Peracetic Acid + H_2O_2	Phenolics
Disinfection	√	√	√	√	√	√	√
Virucidal	√	√	√	√	√	√	√
Fungicidal	√	X	√	√	√	√	√
Sporicidal (C-diff)	X	X	√	X	X	√	X
Sanitizer	√	√	√	√	√	√	√
Shelf life, years*	X	√	√	√	√	X	√
Non-toxic	√	X	X	X	X	X	X
Rinse-free/Residue	√	√	X	√	X	√	X
Surface/Material compatible	√	√	X	√	X	X	√
Environmentally friendly	√	X	X	√	X	X	X
Biodegradeable	√	X	√	√	X	√	X
Low Odor/Fume	√	X	X	√	√	X	√
Non-flammable	√	X	√	√	√	√	√
No added dyes and fragrances	√	√	√	√	√	√	X
No Volatile Organic Compounds (VOC)	√	X	X	X	√	X	X

Alcohol

The FDA has not cleared any liquid chemical sterilant or high-level disinfectant with alcohol as the main active ingredient. Alcohol is highly flammable, can damage plastic materials, can cause skin irritation and its efficacy is limited if organic matter is present.

Bleach

Bleach can be highly corrosive and toxic, causing irritation to skin, eyes and respiratory systems. According to the CDC, bleach can produce ocular irritation or oropharyngeal, esophageal, and gastric burns. It requires careful handling and proper ventilation due to its potential to release harmful fumes.

HOCl vs. Others

Hydrogen Peroxide

HOCl is considered more effective for wound care than hydrogen peroxide because it effectively kills bacteria while being significantly less damaging to healthy tissue, meaning it is less likely to impede the wound healing process. It is less cytotoxic, has anti-biofilm activity, and promotes healing with minimal irritation. In comparison, hydrogen peroxide can harm healthy cells around the wound site and potentially delay healing.

Quaternary Ammonium

Studies show Quats to be low level disinfectants. More importantly, the primary chemicals in Quats have shown to be lung irritants and can contribute to asthma and other breathing problems. They irritate skin and can lead to rashes.

Peracetic Acid + Hydrogen Peroxide

The main problems with using a mixture of peracetic acid and hydrogen peroxide as a disinfectant are its high corrosiveness, potential for severe skin and eye irritation, respiratory irritation from vapors, and the need for careful handling due to its strong oxidizing properties; even at diluted concentrations, exposure can be harmful if proper safety measures aren't taken.

Phenolics

The primary problem with phenolics as a disinfectant is their high toxicity, which can cause skin irritation, burns, eye irritation, and even systemic poisoning if inhaled or absorbed through the skin, even at relatively low concentrations; this makes them a significant health concern, especially with prolonged exposure or improper handling.

Natural, Eco-Friendly or Green

While the terms natural, eco-friendly and green have some similarities, they are not interchangeable and often get used incorrectly.

Natural products are those that are free from synthetic chemicals, but the term is not regulated and can be used loosely by manufacturers. So, while natural cleaners generally won't cause any harm to the environment, it's still not a guarantee.

Eco-friendly products don't necessarily have to be all natural; just because an ingredient is artificially made doesn't mean it will cause harm to the environment. These products have a lower impact on the environment throughout their life cycle, i.e., from the raw materials used in their manufacturing, to their design, transport to the end-user, their length of use and their capacity to be recycled.

Green products are those that have been produced in an environmentally friendly way to have a minimal impact on the environment and are often made from renewable resources. They come from a range of sources: from simple baking soda or vinegar to full-fledged commercial products that have reduced volatile organic compounds (also known as low VOC, which are chemicals emitted as harmful gases), are eco-friendly or have fewer toxic chemicals.

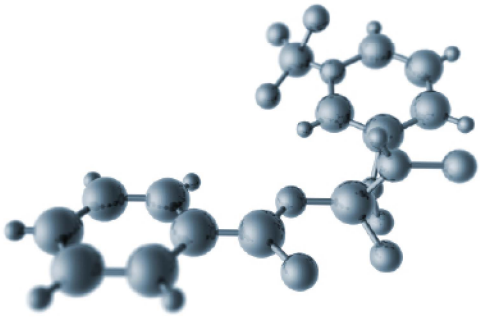
A cleaner or disinfectant is considered green if it passes the criteria for certain standards, including eco-friendliness, non-toxicity, animal cruelty-free, and sustainability.

Natural, Eco-Friendly or Green

HOCl HITS THE TRIFECA

Natural

Although now synthesized and manufactured, HOCl is often referred to as “natural” because it happens to be the same element produced by our white blood cells to fight infection in our bodies.



Eco-friendly

The perfect disinfectant must be safe for use around people and pets and effective in swiftly eliminating a wide range of pathogens. HOCl’s eco-friendly attributes include:

- Its harmless nature is attributed to its non-toxic and hypoallergenic composition, mirroring the elements found naturally in the white blood cells of every mammal.
- HOCl provides effective disinfection without harmful byproducts, ensuring a thorough yet gentle approach.
- HOCl is environmentally friendly and breaks down into harmless components of salt and water.

Natural, Eco-Friendly or Green

Green

There are only a few HOCl products that are Green Seal® certified, meeting the highest benchmark of health and environmental leadership.

Green Seal® is a global nonprofit committed to sustainability and the ecolabelling movement they pioneered decades ago has helped to drive the marketplace toward healthier, greener choices.

The Green Seal certification process ensures that a product meets the rigorous performance, health, and environmental criteria in their environmental leadership standards. Green Seal's scientists and experts comprehensively validate that a product meets its science-based standards before awarding certification.

HOCl Applications

The balanced HOCl profile of safety and efficacy make it a unique and valuable antimicrobial and disinfectant in a variety of settings, including healthcare, dental, agriculture, industrial and commercial, food processing, water treatment facilities, oil and gas, skincare, pet care and household applications.

Hard Surface Disinfecting

HOCl's ability to kill bacteria, viruses, and other pathogens, along with its safety profile, makes it an ideal disinfectant for hard surfaces in any environment. It is particularly effective against a wide range of microorganisms, including drug-resistant strains that are resistant to other disinfectants.

Surface materials include most every common hard surface found in homes, hospitals, schools, hotels, businesses, dental offices, fitness centers, pet care facilities, and the list goes on.

Food and Beverage

In the food and beverage industry, HOCl is commonly used as a disinfectant and sanitizer. It is highly effective in killing bacteria, viruses, and other pathogens that can contaminate food products. It can be used to sanitize food processing equipment, surfaces, and utensils to ensure the safety and quality of the final products.

HOCl's non-toxic nature makes it an ideal choice for use in food preparation areas and at lower concentrations does not require a rinse. Furthermore, it does not leave any harmful residues or odors on surfaces and is safe to use on various types of materials commonly found in the food industry.

HOCl Applications

Skin Care

Because our bodies naturally produce hypochlorous acid to fight infection, and our skin has a natural pH of about 5, HOCl is a great skincare solution with no preservatives, alcohol, oil, parabens, surfactants, or fragrances. HOCl can reduce inflammation without causing oxidative stress, a way to help maintain youthful looking skin.

HOCl cosmetic skincare formulations have a wide range of applications, including toners, facial cleansers, eyelid cleansers, body piercing aftercare, and as a general-purpose topical body spray.

Wound Care

HOCl has been proven to be effective in reducing inflammation, promoting wound healing, and combating acne, making it an ideal ingredient for skincare products with curative properties.

HOCl is used in wound care as a topical antiseptic due to its broad-spectrum antimicrobial activity, meaning it can kill a wide range of bacteria, viruses, and fungi that can infect wounds, while also promoting wound healing by reducing inflammation and supporting oxygenation at the wound site.

Dermatologists and other skin experts often recommend using products with HOCl to fight common bacterial skin problems like acne, eczema, and psoriasis.

HOCl Applications

Pet Care

When it comes to pet health care, HOCl stands out as an effective solution to a variety of health issues while providing numerous benefits:

- HOCl accelerates wound healing and reduces the risk of infections by helping to manage cuts, scrapes, lacerations and minor burns.
- Because it provides gentle cleansing without irritation, HOCl has become popular for treating itchiness, redness, hotspots, and more.
- HOCl has proven to be an effective solution for fighting plaque, tartar, and gingivitis while maintaining and increasing oral hygiene and fresher breath.
- HOCl is a gentle and yet powerful way to cleanse your pet's ears to help prevent infections, as well as other common issues.

Agriculture

HOCl has been used in agriculture and farming for decades. Because HOCl is pH neutral, it is commonly used for crop control during both pre- and post-harvest. By dramatically improving post-harvest rot, it contributes to larger crop yield as spoilage is now vastly reduced.

The USDA clarified that HOCl is appropriate for organic production and handling, and that it can be used as a no-rinse disinfectant on fruit and vegetables.

Studies have demonstrated the strong antibacterial activity of HOCl against foodborne pathogens on raw agricultural products and food contact surfaces, stating it is an advantageous alternative to other chlorine disinfectants and sanitizers.

HOCl Applications

Indoor Grow

Hypochlorous Acid (HOCl) quickly kills a variety of fungi and shows promise as a broad-spectrum contact fungicide for control of foliar diseases of greenhouse-grown ornamentals.

HOCl can be used in irrigation and hydroponic applications, to treat indoor growth surfaces and apparatus, and used as a foliar spray. Research has observed visible and measurable improvements in:

- Biofilm reduction
- Less mineral salt build-up
- Improved root health
- Faster growth rates
- Fewer pest issues
- Easier crop turnovers

HOCl can eliminate bacteria, viruses, and fungi without causing harm to the plants. When added to nutrient solutions, HOCl protects against harmful pathogens while lowering the need for costly sterilization systems like UV or ozonation. It is a natural, non-toxic, and environmentally friendly way to maintain a healthy hydroponic system and ensure optimal plant growth.

Oil & Gas

Hypochlorous acid is used in the oil and gas industry for a variety of applications, including:

- Disinfecting fracking water
- Preventing biological contamination
- Neutralizing hydrogen sulfide (H_2S)
- Controlling Sulfate Reducing Bacteria (SRB)

HOCl has been recognized as an H_2S "scavenger" because it binds to H_2S and takes it apart at a molecular level, effectively neutralizing it.

As a highly potent, yet safe, biocide, HOCl is the eco-friendly solution that addresses the major controversies associated with fracking: pollution of groundwater with toxic chemicals, release of H_2S that endangers oil field workers' lives, and excess wastewater.

HOCl Applications

Water Treatment

HOCl is used in municipal water treatment plants to kill harmful bacteria, viruses, and parasites present in the water supply and has gained popularity in water treatment applications due to its numerous benefits, including:

- Highly effective in killing bacteria, viruses, and other harmful microorganisms present in water.
- Broad-spectrum antimicrobial properties make it an ideal choice for ensuring safe drinking water.
- Non-toxic and environmentally friendly alternative to traditional chlorine-based disinfectants

Unlike chlorine, which can produce harmful byproducts such as chloramines and trihalomethanes, HOCl decomposes into harmless components after disinfection. This makes it a safer option for both human consumption and aquatic life.

Fogging & Atomizing

HOCl fogging and atomizing to disinfect has gained popularity because of its simple, nontoxic and nonirritating method of disinfecting for both ambient air and hard to reach surfaces. It also provides the benefit of covering larger areas in less time.

HOCl not only neutralizes airborne pathogens like bacteria, viruses, and mold spores, but it also eliminates odors naturally and disinfects hard-to-reach surfaces that are often missed in routine cleaning.

Airborne pathogens are a major concern in any number of environments where proximity of people and/or animals, combined with poor air circulation, can result in the rapid spread of viruses and bacteria. Regular disinfection with HOCl can reduce these risks, offering an efficient, non-toxic solution that not only neutralizes harmful germs in the air and on surfaces but also enhances overall air quality, reducing odors and improving the safety of those involved.

Choosing an HOCl Manufacturing Partner

You now know all about HOCl and its amazing benefits. If you are a chemist for a successful skincare brand, or a V.P. of Product Management at a pharmaceutical wholesaler, or Director of Product Development for an established brand, adding a new HOCl product to your portfolio has long-term implications and must be done carefully.

Choosing an HOCl manufacturing partner is a critical step in ensuring that you can consistently deliver quality HOCl to your customers for years to come. You should be looking for a long-term partner and not simply a company who can manufacture HOCl a few times with success. Longevity, repeatability and premier customer support should be requirements when searching for a long-term partner. Since HOCl is still in its infancy with regards to market applications and penetration, production and/or quality issues will come at a high cost. Switching costs are expensive, take time and can result in damaging your reputation, customer dissatisfaction and churn.

Below is a list of the top criteria that should be considered when selecting an HOCl manufacturing partner:

1. **Manufacturer or Reseller:** If the company is not the actual manufacturer, but only a reseller, they have no control over the performance of the product.

2. **Staying Power:** How long have they been in business and do they have a reputation as a leader in the manufacturing space?

3. **United States Facility:** Supply chain is a critical and ever-changing component to cost reduction, efficient delivery and overall customer satisfaction. Would a U.S. manufacturer provide your company with a competitive advantage in the HOCl marketplace?

4. **Specific Knowledge:** Are they subject-matter experts on HOCl and do they have the staff to substantiate this claim?

5. **Registered & Unregistered Products:** Do they have an EPA-registered and/or FDA-cleared HOCl product, and the flexibility to manufacture custom HOCl products on demand?

Choosing an HOCl Manufacturing Partner

6. **Certifications:** Are they ISO 9001:2015 certified and do they follow GMP guidelines? Can they confirm the quality of their HOCl with a detailed QA program and product specific certifications, such as Green Seal and NSF?

7. **Manufacturing Process:** What type of manufacturing process is used to produce their HOCl? Though the manufacturer will not disclose proprietary details, you should know the basics of how their HOCl is manufactured. Is it Membrane Cell or Single Cell, for example?

8. **Stability:** What is the shelf-life of their HOCl and do they have proof of its stability from a GLP lab (Good Laboratory Practice)?

9. **Flexibility:** Are they flexible and able to provide the HOCl concentration (PPM) you need, along with Certificates of Analysis to validate?

10. **Research & Development:** Do they have the ability and willingness to collaborate with your team in the development of new HOCl products?

11. **Capacity:** Do they have the bandwidth to meet your production capacity needs and deliver on time?

12. **Filling and Packaging:** Do they offer filling, labeling, packaging and shipping in multiple container sizes?

13. **Support:** Will they support you and offer consultation each step along the way? It's a team effort.

It should be no surprise that, as with all important decisions, you must do your homework when selecting an HOCl manufacturing partner. Vet them. Ask questions. Request samples for testing.

Selecting the right HOCl manufacturing partner will ensure you are able to maintain a major competitive advantage and be well-positioned for the long haul to capture a slice of the growing HOCl market.

Sources

Balard, Antoine Jerome, Complete Dictionary of Scientific Biography, Vol. 1. Charles Scribners Sons, 2008, pp.416-417
Balard, A. J. (1834). "Recherches sur la nature des combinaisons décolorantes du chlore"
(Balard, 1834), p. 293. From p. 293: "Quelle dénomination ... appelées hypochlorites."

Sterasure: https://rb.gy/jzl0ry

Disinfection Using Chlorine Bleach. (December, 2011), OSU Biological Safety / Environmental Health & Safety / 541-737-4557

Open Forum Infect Discussion. NIH Study 2018 Nov; 5(Suppl 1): S346.

Hydrogen Peroxide. National Institute for Occupational Safety & Health (NIOSH)
(May 1994), Immediately Dangerous to Life or Health Concentration (IDLH)
https://rb.gy/ljt1kl

Hypochlorous Acid (HOCl) for disinfection, antisepsis, and wound care in Core Categories 15.1, 15.2, and 13 (Submitted November 2020, Rev Dec 2020). Application for Inclusion in the 2021 WHO Essential Medicines List, Briotech, Inc.

Jacobsen, S DVM, PhD, Diplomate ECVS, (Last accessed May, 2021) Chapter 5: Topical Wound Treatment and Wound-Care Products - Antiseptics. Veterian Key, Fastest Veterinary Medicine Insight Engine.

Nestor, M. S., Berman, B., Patel, J., Lawson, A., Jones, J. L., & Matin, T. A Pilot Study To Assess The Efficacy And Tolerability Of Two New Proprietary, Pure Hypochlorous Acid-Based (HOCL) Treatments For Mild-To-Moderate Acne Vulgaris.

Apinut Wongkietkachorn, MD; Palakorn Surakunprapha, MD; Jakrapan Wittayapairoch, MD; Nuttapone Wongkietkachorn, MD; Supawich Wongkietkachorn, MD (Copyright © 2020) The Use of Hypochlorous Acid Lavage to Treat Infected Cavity Wounds PRS Global Open, Case Report. Wolters Kluwer Health, Inc. on behalf of The American Society of Plastic Surgeons.

David E. Allie, MD; Andrés A. Gutiérrez, MD, PhD; Tom A. Wolvos, MD, FACS; Luca Dalla Paola, MD; Ariel Miranda Altamirano, MD (January 2006). Clinical Experience with a New, Stable, Super-Oxidized Water in Wound Treatment. Supplement to January 2006 Wounds, A Compendium of Clinical Research & Practice.

Gold, M. H., Andriessen, A., Bhatia, A. C., Bitter Jr, P., Chilukuri, S., Cohen, J. L., & Robb, C. W. (2020). Topical stabilized hypochlorous acid: The future gold standard for wound care and scar management in dermatologic and plastic surgery procedures. Journal of cosmetic dermatology, 19(2), 270-277.

Sakarya, S., Gunay, N., Karakulak, M., Ozturk, B., & Ertugrul, B. (2014). Hypochlorous acid: an ideal wound care agent with powerful microbicidal, antibiofilm, and wound healing potency. Wounds, 26(12), 342-350.
https://rb.gy/tfctdo

Scientists warn of disinfectant dangers: Study, Environmental Health News, Brian Bienkowski, (May 2023)

Quaternary Ammonium study: Google / AI Overview, https://rb.gy/pfx53w

Hussein A. Kaoud, Salah Yosseif (December 2013). Innovative Method for the Treatment of Skin Infections in Dogs. The Journal of Veterinary Science, Photon

Sources

HiccPet Blog - https://rb.gy/2npmr6

National Organic Program; Amendments to the National List of Allowed and Prohibited Substances (Crops, Livestock and Handling). (Dec 2018)
A Rule by the Agricultural Marketing Service

Formal Recommendation From: National Organic Standards Board (NOSB) To: the National Organic Program (NOP) (April 27, 2016)
Subject: Addition of hypochlorous acid generated from electrolyzed water, as petitioned, at §205.605(b) of the National List

Electrolytic Biocides: green alternative for stimulation protection and formation biomass remediation, DL Holcomb, TL Zitkus, L Jones – … of the Annual …, 2005 – Southwestern Petroleum Short Course

Green biocides, a promising technology: current and future applications to industry and industrial processes, MA Ashraf, S Ullah, I Ahmad, AK Qureshi… – Journal of the …, 2014 – Wiley Online Library

Case study: evaluation of an oxidative biocide during and after a hydraulic fracturing job in the Marcellus Shale, SM Rimassa, PR Howard, B MacKay… – … Symposium on Oilfield …, 2011 – onepetro.org

Aqueous Solution For Managing Microbes In Oil And Gas Production And Method For Their Production, SA Emmons – US Patent App. 12/907,309, 2010 – Google Patents

Ross Trieu. The Hospital Disinfectant That's Making Fracking Greener
Jul 22, 2014, https://rb.gy/oij34t

Grozine (For Growers By Growers), Online Publication, November 2021. Clear Line Hydroponic Hypochlorous Acid Review, https://rb.gy/vq2m6g

Kelly A. Reynolds, PhD; Jonathan D. Sexton, PhD; Fernanda Garavito, MPH; Brandie Anderson, BS, RN, BSN, MPH, CIC2; Joan M. Ivaska, BS, MPH, CIC3
(February 2021). Impact of a Whole-Room Atomizing Disinfection System on Healthcare Surface Contamination, Pathogen Transfer, and Labor Efficiency. Original Basic Science Report, PubMed, National Library of Medicine.

Project title Misting trial at Chilled Environment Pack House (Start date 27/08/2020). Aqualution Study, Sector Produce Packing
Status Report on Topical Hypochlorous Acid: Clinical Relevance of Specific Formulations, Potential Modes of Action, and Study Outcomes (Published online Nov 2018). Journal of Clinical and Aesthetic Dermatology Study

Hypochlorous Acid: A Review. NIH Study, J Oral Maxillofac Surg. 2020 Sep; 78(9): 1461–1466.

Comparison of cleaning efficacy between in-use disinfectant and electrolysed water in an English residential care home. IPublished online 2011 Dec 21). Journal of Hospital Infection: Aqualution Systems Ltd, Duns, UK; BUPA Care Services, Horsforth, Leeds, UK, Department of Microbiology, Hairmyres Hospital, East Kilbride, Glasgow, UK