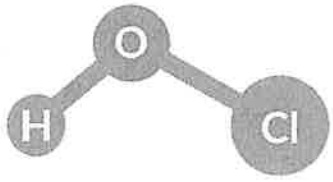
PURE HYPOCHLOROUS

ERADICATE 99.999% OF DEADLY GERMS & BACTERIA WITH PURE HYPOCHLOROUS

THE MOST EFFECTIVE SANITIZER IS THE EASIEST TO USE

Our pure hypochlorous kills 99.999% of deadly germs and bacteria in ten minutes or less; and it's 100x stronger than bleach—with none of the risks to eyes, skin or lungs. No need to wear PPE when applying because there's no additives, harsh chemicals or fumes. Safe for plants, animals and humans. Spray or mist air, porous and non-porous surfaces for immediate occupancy when needed. HOCL* eradicates infectious diseases: Poliovirus, H1N1, MRSA, SARS-CoV-2, E-coli, HPV, Salmonella, Staph, Strep and drug-resistant bacteria. Hypochlorous is 'N' Listed as an ingredient that meets EPA's criteria for use against COVID-19.



WHY PURE HYPOCHLOROUS IS MORE EFFECTIVE THAN BLEACH OR OTHER HARSH CHEMICALS

Pure hypochlorous is completely safe to use, yet is a powerful oxidant 100x more efficient at killing bacteria and germs than chlorine bleach. Hypochlorous is an organic substance that is a neutral acid found in our white blood cells to fight viruses and foreign invaders. As part of our body's immune response, HOCL fights infection and inflammation. On our skin, HOCL kills bacteria, viruses and fungi. Doctors use pure hypochlorous in eye surgery, dental surgery and in wound care to stimulate and speed healing.

Our scientifically formulated pure hypochlorous is made by a patented process that replicates the body's own HOCL compound by electrolyzing a mixture of clean water and salt. The purity and stability of the HOCL molecules is needed to ensure efficacy, and that's why we sell a premium formulation of HOCL with two years of shelf life. Our formulation is EPA registered, meets USDA criteria for certification as organic, and has no harmful by-product or additive to require OSHA guidelines.

**Please Note: HOCl (with lower case 'l') is a molecule comprised of Hydrogen + Oxygen + Chloride (not to be confused with bleach or sodium hypochlorite). Hypochlorous is*

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CLEAN WITH HYPOCHLOROUS TO SAVE LIVES & LABOR

GENERAL USE:
Our solution of 200 ppm pure hypochlorous is more than 100x stronger than bleach and requires no dilution or rinsing. To find out how much product will cover your area for treatment, we estimate gallons or ounces needed for misting a volume of space within a square foot area. Spray HOCL at 8' above floors to allow particles to both sanitize exhalations by infected persons and to settle onto surfaces. A 2.5 Gallon jug covers the air and space of 5900 SF or 39 standard size (10' x 15') rooms. Our solution at 3:1 dilution is more than 50x stronger than bleach, meets FDA criteria for spraying directly onto produce, meat and fish, and covers the air and space of 17,700 SF or 117 standard size rooms. Our solution at 4:1 dilution is more than 20x stronger than bleach and covers 23,645 SF or 156 standard size rooms.

DECONTAMINATION OF AREAS:
The best delivery device for saturation is an ultra-low volume cold mister, fixed or portable. For maximum sanitization with 100% safety margin, mist a standard size hotel or hospital room for 2 minutes at approximately 8' high and let particles inactivate germs in breathing space before settling onto hard and soft surfaces. (Spray or mist pencil trays, office supplies, athletic equipment, toys and touch points like light switches, doorknobs, faucets and drinking fountains). 100% safety margin is achieved by misting for 2 minutes, with 10 minutes of dwell time (no motion). If there are no known cases in areas, 3 minutes dwell time is sufficient.

MEDICAL SANITIZATION:
Apply to surfaces after traditional cleaning at end of day. Spray toilets every 6 hours. Hand disinfect with hypochlorous before and after contact with every patient. Patients in hospital wards or nursing homes can remain in place when applying. Humidify bedside for 5 minutes every hour. Mist intensive care units (individual rooms) for 30 seconds every 24 hours for same patient. If ward open, mist every 24 hours and air dry. Mist waiting areas and emergency rooms every 6 hours and pharmacies nightly; pharmacists should apply HOCL on hands after every patient.

SCHOOLS, CHURCHES, HOTELS, DAYCARE, OFFICES, JAILS, DETENTION CENTERS:
Spray or mist surfaces nightly including food prep areas, chairs/chairbacks/upholstery/pews. Spray toilets, sinks and touch points every 6 hours. Mist schools with or without students inside depending upon local decision. Provide HOCL as hand sanitizer wherever possible, encourage use. Mist detention centers every 6 hours. (Spray 3:1 dilution directly onto food before preparation).

COMMUTER STATIONS/TRANSPORT/BUSES/ BOATS/SUBWAY & TRAIN CARS:
Spray or mist surfaces, seats, doors, handrails and toilets after every trip. Portable misters work fastest. Mist seats on buses, trains, airplanes, transport vehicles or ferries after every trip. Mist buses, airplanes, train and subway cars nightly. On long flights, mist cabins mid-flight. Mist airports and stations every 6 hours in all areas: rooms, toilets, stalls, urinals, sinks, doorknobs. On cruise or merchant ships, mist every 6 hours; mist cabins from one meter away or less in every cabin every night. Disinfect touchpoints leaving and entering ports.

For questions, email info@arcient.com

Brio Pure Hypochlorous Acid Science and Engineering

Eric Rasmussen, MD, MDM, FACP
Chief Medical Officer, Briotech

Introduction

Stabilized hypochlorous acid (HOCl) is rapidly emerging as an exceptionally effective environmental disinfectant. This development seems especially fitting amidst growing concerns about eco-persistence of synthetic chemicals, and antimicrobial resistance trends amongst newly resurgent agents of disease.

HOCl is considered by the FDA to be "the form of free available chlorine that has the highest bactericidal activity against a broad range of microorganisms" but has seen its use limited by an historical reputation for rapidly degrading into ineffective and cytotoxic metabolites.

Biochemistry and immunology

Hypochlorous acid was identified as a distinct chemical entity more than 150 years ago. Its anti-infective properties were recognized, even before the widespread use of aqueous chlorine, as an antiseptic for traumatic wounds in World War I. Subsequent applications were developed for environmental sanitation and therapeutic use in gangrene, diphtheria and scarlet fever. By the 1940's aerosolized solutions of acidified hypochlorite were being used in London hospitals as an infection control measure against airborne dispersion of pathogens with a clear understanding of the contribution of HOCl to the observed outcomes.

Decades later came the discovery that HOCl is naturally formed within activated human neutrophils and other tissue-resident phagocytes. This comes about through myeloperoxidase (MPO) activity on peroxides and cytoplasmic Cl^- ions during the 'oxidative burst' triggered by phagocyte activation. Physiologically-generated HOCl is short-lived, as the highly reactive compound quickly participates in oxidation and halogenation reactions. Antimicrobial effects on bacteria within phagosomes are rapid and powerful, but reaction products with intracellular proteins, amino acids, and small molecules persist with much longer half-lives and participate in a host of downstream events. Taurine, for example, is found in high concentrations in neutrophilic granulocytes and is readily chlorinated by HOCl to produce stable taurine chloramine which helps mediate healing events. Moreover, recent evidence points to an essential role for HOCl in initiating the formation of, and participating in, Neutrophil Extracellular Traps (NET) that are involved in killing of pathogens outside the confines of phagocytic vacuoles.

Modern synthesis and clinical use

HOCl has been synthesized and used for clinically important wound and area disinfection since before World War One, but unstable and poorly reproducible preparation techniques have limited its use. Buffered biochemical preparations frequently incorporated multiple chlorine species beyond hypochlorous acid, and virtually all complex chlorine molecules other than HOCl have significant caustic and cytotoxic effects. The preparations were also short-lived. Even professionally prepared HOCl solutions lasted for only a few hours before degrading.

The historical instability and impurity of synthesized HOCl has now been corrected by several recent nanoengineering advances. The sum of these new processes, patented by Briotech of Woodinville, Washington in the US, enables large-scale production of a highly stable and very pure formulation of hypochlorous acid. This new process generates HOCl that (1) has no other measurable chlorine species present, (2) delivers a consistent pH across time and temperature, and (3) maintains a stable oxidation-reduction potential. Each of those three are reliable surrogates for stability and efficacy and have been incorporated into formal external evaluations.

Brio synthesis and validation

Unlike prior impure and easily-degraded HOCl, Brio is a stable and pure HOCl and an effective and safe compound in a wide variety of test systems and applications. BrioHOCL® is produced as a final product in a single formulation run on a mechanical nanoengineering protocol with a precisely controlled pH. There is no component biochemistry and so no buffers and no unexpected molecules present in solution. That initial pH is important because, at pH 3 or below HOCl exists in solution with hydrochloric acid and chlorine (HCl and Cl_2, respectively). In solutions where the pH is greater than 7.5 hypochlorite (^-OCl) predominates. Eventual reduction of oxidative chlorine to the chloride ion (Cl^-) leads to a decrease in antimicrobial activity over time and so such compounds are described as "highly unstable". The pure molecule HOCl, when produced as BrioHOCL®, has no toxic material disposal requirements, and is not considered by OSHA to be hazardous waste, adding yet another advantageous element to HOCl use.

Raman spectroscopy has been used to characterize the magnitude of various chlorine species within Brio HOCl and the wavenumber tracing below shows the purity of the nanoengineering result. There are no other molecules. This graph from the Molecular Engineering Laboratory at the University of Washington in Seattle shows that there is nothing present in solution except hypochlorous acid (any spike remaining below 0.2 NI is considered insignificant). All other formulations of HOCl are biochemically generated and externally buffered to a general pH range and so have remnant caustic and cytotoxic contaminant chorine species - but not Brio. That purity is why Brio can be used for therapeutic anti-infective interventions in eyes, sinuses, and oral cavities and why it does not bleach materials. It's not bleach.

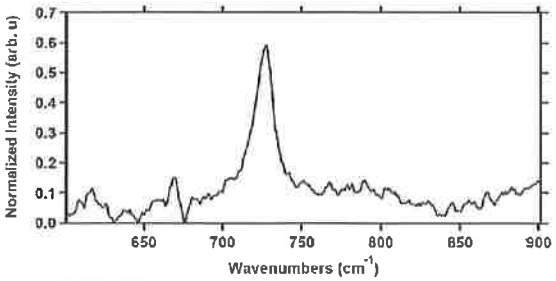

Figure 1: Raman spectroscopy of BrioHOCL®. The single prominent peak around 725 cm^{-1} indicates that the Briotech solution is overwhelmingly HOCl. Other chlorine species (e.g. as Cl_2 or as ClO^{-1}) were not detected in our sample. Irregularities in the background are attributable to light scatter and are not identifiably associated with any constituent of the aqueous sample. Molecular Engineering Laboratory, University of Washington, 20 April 2016

There are extensive peer-reviewed references for every statement made above. Please contact Eric Rasmussen at Briotech if you have any questions.

BRIOTECH
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Brio Coronavirus Disinfection Protocols

Briotech, Inc.

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1. Overview

a. Brio is a disinfectant that uses the same molecule, HOCl, to disinfect surfaces that the human immune system uses to kill infectious pathogens. That molecule is synthesized through a process that creates only that HOCl molecule, pure and stable.
b. Brio can selectively oxidize and halogenate components of all classes of biological molecules– proteins, carbohydrates, lipids. Through these fast reactions it can degrade the whole range of infectious agents that afflict mankind, including influenza (such as H1N1), coronaviruses,drug resistant bacteria, and even infectious proteins that are unaffected by any other disinfecting solutions.
c. Brio is extremely effective at eliminating coronavirus, eradicating 99.999% of the virus in ten minutes or less.
d. Brio is very safe, and is used to treat eye infections and mouth infections, and Brio does not stain clothes.
e. Brio is very stable over time, and across a wide temperature range. When kept closed in the original container it can remain effective for three years. When exposed to heat or cold, -80°C to +80°C, and then returned to room temperature, it loses very little potency.
f. Brio, although it contains chlorine, is not bleach. Brio, in fact, kills coronavirus at least a 100 times better than bleach, with none of the risks bleach has for hurting people or damaging surfaces.

2. Definitions (*US Centers for Disease Control, 2019*)

a. **Cleaning** is the removal of visible soil (e.g., organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products. Thorough cleaning is essential before high-level disinfection and sterilization because inorganic and organic materials that remain on the surfaces of instruments interfere with the effectiveness of these processes.
b. **Disinfection** describes a process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects. In health-care settings, objects usually are disinfected by liquid chemicals or wet pasteurization. Each of the various factors that affect the efficacy of disinfection can nullify or limit the efficacy of the process.

c. **Sterilization** describes a process that destroys or eliminates all forms of microbial life and is carried out in health-care facilities by physical or chemical methods. Steam under pressure, dry heat, EtO gas, hydrogen peroxide gas plasma, and liquid chemicals are the principal sterilizing agents used in health- care facilities.
d. Factors that affect the efficacy of both disinfection and sterilization include prior cleaning of the object; organic and inorganic load present; type and level of microbial contamination; concentration of and exposure time to the germicide; physical nature of the object (e.g., crevices, hinges, and lumens); presence of biofilms; temperature and pH of the disinfection process; and in some cases, relative humidity of the sterilization process (e.g., ethylene oxide).
e. ***Note: Brio provides the highest level possible of disinfection of all classes of infectious agents but it is not a cleaning solution.***

3. **General Cleaning Principles**
   a. Surfaces must be cleaned before they can be disinfected. Surfaces must be washed with soap and water under standard protocols, with all organic material removed, before Brio is applied.
      i. Early disinfection studies performed long before Brio existed revealed that, under identical test conditions, a conventional disinfectant took 30 minutes to kill 10 *B. subtilis* spores, but three hours to kill 100,000 *B. subtilis* spores. Viruses and bacteria behave similarly, so it is critical that surfaces be cleaned thoroughly before they are disinfected.
   b. Floors should be cleaned last, as the process of cleaning higher surfaces deposits contaminants, including bacteria and viruses attached to particulates, on the floor. The use of soap and water on floors reduces pathogen loads by roughly 80%, where a true disinfectant like Brio reduces pathogen loads by 94% and more. However, studies have shown that floors that have been disinfected demonstrate a bacterial count basically back to pre-cleaning baseline within a few hours.
   c. Disinfection of transition surfaces has proved important to reduce infections acquired in medical facilities. Doorknobs, bed rails, carts, bedside tables, faucet handles, and the first three feet from the edge of a bed curtain, harbor exceptionally high pathogen loads.

4. **Brio Preparation**
   a. Brio contains a disinfecting molecule, HOCl, dissolved in a mild salt solution and delivered as a wash, spray, mist, or fog.
   b. Brio is safe, and no Personal Protective Equipment (PPE) is required during use. It is fundamentally Normal Saline IV fluid with a few hundred parts per million of a disinfectant, HOCl. HOCl is US EPA-registered and certified Organic by the USDA.
   c. Brio can be used in several strengths, and often arrives concentrated. If concentrated it should be diluted before use.
      i. **Brio Concentrate:** 375ppm HOCl in 2.05% saline solution.
      ii. **Areas and Surfaces:** For use as a wash, spray, mist, or fog, dilute Brio Concentrate 1:1 with an equal amount of clean water produced by reverse osmosis or distillation.
         1. The dilution water quality standard are these:
            a. TDS: < 20mg/liter
            b. pH: 4.0-7.0
            c. Turbidity: < 0.02

2. The resulting normalized Brio (~185ppm in 0.9% saline) should be stored in a light-tight, air-tight container. Opaque plastic is acceptable, dark blue glass is ideal.

iii. **Topical skin decontaminant:** Brio has been used by thousands of patients for the care of skin infections, surgical incisions, burns, traumatic injuries, and cosmetic improvements. Normalized Brio described above (~187ppm in 0.9% saline) is the concentration found most effective and can be safely used on skin.

5. **Brio Dispersion Methods**
   a. Site decontamination using wash or spray
      i. After a surface has been thoroughly cleaned (see 3a above) Brio can be used as a focal disinfectant, usually from a spray bottle, where a larger-scale disinfection process might be inappropriate. Reasons might include presence of exposed electronic equipment, open laboratory samples, or uninvolved family members.
      ii. Spray the surface lightly until fine droplets are seen completely covering the contaminated surface. Allow to air-dry. Do not wet excessively. No rinsing needed.
   b. Area decontamination using a mist or fog
      i. **Misting** implies aerosolizing a droplet size larger than 30 microns and easily visible. **Fogging** implies aerosolizing a droplet size smaller than 20 microns. Either can be effective in delivering Brio penetration into high surfaces, complex rooms, and large areas, with no requirement for PPE and no room-occupancy delay after fogging. A fog droplet size is preferred to a mist droplet size for penetration.
      ii. The goal of room disinfection is to use enough Brio to decontaminate all corners and surfaces of the room without using more Brio than is needed or getting the room excessively wet.

6. **Brio Dispersal Equation (BDE):** The BDE only needs to be determined for a room once, then that value becomes the BDE timing for that room and won't change unless one of the delivery variables change. The delivery device should be a fogger, fixed or portable, with a droplet size of less than 20 microns.
   a. The equation for the estimated fogging delivery of a proper volume of Brio at standard concentration (185ppm in 0.9% saline) for a room disinfection is based on the following:
      i. **Must deliver for effective disinfection:** Brio minimum delivery concentration for coronavirus eradication is 30ml per 4.24 cubic meters of room volume, or 70ml of Brio per 10 cubic meters of room volume.
         1. That results in a minimum delivery of 160ml of Brio fogged into a standard 22.5 cubic meter room.
      ii. **Airflow:** Standard foggers deliver roughly 128 cubic meters airflow per minute.
      iii. **Liquid in that airflow:** Standard foggers deliver roughly 200 ml of Brio per minute in that 128 cubic meters of airflow.
      iv. **Therefore**, one full minute of delivery would meet the minimal requirements for Brio delivery for a standard hospital room (200ml delivered when 160ml needed), and Briotech strongly recommends a 100% safety margin, so the recommendation is:
         1. Delivery of 2 minutes fogging for a 22.5 cubic meter room, with a
         2. Dwell time (no motion) of 10 minutes for Brio to act on any coronavirus.

3. Remember: Room size (Length, Width, Height) in cubic meters
    a. Example: a standard room 3m x 3m x 2.5m = 22.5 m^3

In a 22.5 m^3 room a fog distributed for two minutes will not 'wet' the walls but create a hanging fog visible throughout the room. If for pathogen disinfection, the subsequent Dwell time (to allow complete penetration and exposure to HOCl) should be 10 minutes before any room activity. If only for maintenance with little likelihood of infection since the last fogging, the Dwell time can be three minutes.

PLEASE NOTE CAREFULLY: These are estimations based on experience with foggers and rooms and pathogens that may be different in many ways from those experienced by others. Work with your Infectious Disease specialists and hardware manufacturers to ensure your Brio fogging delivers your desired disinfection goals. Briotech cannot be held responsible for the variations in fogger performance, HVAC flow, physical obstructions, or any other circumstance beyond our control. Test your techniques and processes repeatedly to ensure you're meeting your disinfection metrics.

7. Medical Facility recommendations

a. Operating Room

i. Surface disinfection with Brio after cleaning per conventional protocol.
ii. BDE delivery by fogger at the end of the day.
iii. Hand disinfection with Brio before and after every patient contact.

b. Hospital Ward

i. For individual rooms, 30 seconds of fog delivery every 24 hours, air dry.
    1. No PPE needed, and the patient can optionally remain in place.
    2. Spray toilet every 6 hours.
    3. Brio bedside humidifier 5 minutes every hour
    4. Hand disinfection with Brio before and after every patient contact
ii. On patient turnover
    1. Surface disinfection using Brio per institutional protocol.
    2. BDE by fogger before occupancy and air dry.
    3. Hand disinfection with Brio before and after every patient contact
iii. If open ward, BDE by fogger every 24 hours and air dry.

c. Intensive Care Unit

i. For individual rooms, 30 seconds of fog delivery every 24 hours, air dry.
    1. No PPE needed, and the patient can optionally remain in place.
    2. Hand disinfection with Brio before and after every patient contact
ii. On patient turnover
    1. Surface disinfection using Brio per institutional cleaning protocol.
    2. BDE by fogger before occupancy and air dry.

d. Waiting Area

i. Surface disinfection with Brio as needed.
ii. BDE by fogger every six (6) hours.

iii. Provide Brio as hand sanitizer and encourage frequent use.

e. Emergency Ward

i. Surface disinfection with Brio after every patient per institutional protocol.
ii. BDE by fogger every six hours.
iii. Hand disinfection with Brio before and after every patient contact.

f. Medical Clinic

i. Surface disinfection with Brio after every patient per institutional protocol.
ii. BDE by fogger nightly.
iii. Hand disinfection with Brio before and after every patient contact

g. Pharmacy

i. BDE by fogger nightly
ii. Hand disinfection with Brio before and after every patient contact.

h. **Holding Areas** (quarantine or awaiting evaluation)

i. Surface disinfection with Brio when needed.
ii. BDE by fogger nightly.
iii. Hand disinfection with Brio before and after every patient contact.

8. Non-Medical Facilities

a. School

i. Surface disinfection with Brio when needed.
ii. BDE by fogger nightly in every room.
    1. May be done while classrooms are occupied - local decision.
    2. Provide Brio as a classroom hand sanitizer and encourage use.

b. Hotel or office building (and other enclosed and occupied sites)

i. Surface disinfection with Brio when needed.
ii. BDE by fogger nightly.
iii. Provide Brio as occupant hand sanitizer and encourage use.

c. Transportation

i. Auto
    1. Surface disinfection with Brio after every trip.
ii. Train
    1. Portable fogger onto every seat from one meter or less, including toilets and cafeteria, every four hours when occupied.
    2. BDE by fogger in each car nightly.
iii. Bus
    1. Portable fogger from one meter or less onto every seat every time the bus empties.
iv. Aircraft
    1. Portable fogger from one meter or less onto every seat prior to boarding.

2. May opt to fog the cabin mid-flight. (optionally using liter-bottle trigger spray to mist the air and sanitize focal areas)

v. Cruise ship:
    1. Portable fogger from one meter or less in every cabin every night.
    2. BDE by fogger all gathering spaces every night.

vi. Merchant shipping
    1. Portable fogger from one meter or less in every cabin every night.
    2. Portable fogger on container doors and locks twice - leaving and entering port.

d. Displacement Center

i. BDE by fogger every 6 hours.
ii. Spray toilets every 6 hours

e. Markets

i. Mist stalls before opening, mid-day, and after closing.
ii. Spray all high-touch surfaces periodically through the workday.
iii. Fog each market stall for two minutes at closing.

f. Airports

i. Fog each Security lane, jetway, waiting area, toilet, baggage claim, and check-in counter every 6 hours.
ii. Fog all back-office operations, including administration, baggage management, food handlers, and maintenance areas every 8 hours.

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