



Hypochlorous Acid

The active ingredient in eWater Sanitiser & eWater Disinfectant

Overview

eWater Sanitiser and Disinfectant (eWater) a powerful antimicrobial produced by an eWater Hygiene System. Shown to be effective across a wide range of both bacterial and viral microorganisms,

As a solution eWater contains a high concentration of Hypochlorous Acid and a high oxidising reduction potential (ORP). These characteristics create an environment in which microbes cannot survive and provide an effective and safe alternative to alcohol and quat based sanitising agents.

Uniquely, Hypochlorous Acid in eWater is endogenous and therefore can be used safely on skin without any PPE. Additionally, eWater will naturally biodegrade, ensuring no chemical residue is left and no contamination enters our environment.

Efficacy of eWater Disinfectant against COVID-19

eWater Disinfectant has been tested against Coronaviruses has been listed on the ARTG by the Therapeutic Goods Administration as a hard surface disinfectant proven to kill Coronaviruses including SARS-CoV-2 (COVID-19).

This listing makes eWater the first onsite generator to be included on the ARTG. When considered alongside existing HACCP, Organic and GECA certifications, this ARTG listing makes eWater a truly unique and capable product solution in the market today.

Product Efficacy

To gain acceptance to the ARTG, the Australian Therapeutic Goods Administration (TGA) conducted a thorough review of eWater Disinfectant, including laboratory testing to validate the efficacy of the solution.

The results of these tests demonstrated that the eWater passes the Option C disinfectant testing regime, in addition to achieving a >5.56 Log or 99.9995% kill rate, well above the 4 Log / 99.99% benchmark on the Coronavirus testing

eWater Disinfectant ARTG No. 343004



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What is Hypochlorous Acid?

Hypochlorous Acid (HClO) is a weak acid that is widely recognised as the most effective antimicrobial in the chlorine family and is the active ingredient in bleach. It is also naturally produced by our neutrophils, or white blood cells to fight microbial infection and inflammation. Uniquely this makes HOCl one of the only non-toxic disinfection agents.

Why isn't HOCl used everywhere?

HOCl solutions have been used for over 100 years and were used during the world wars for disinfecting medical equipment and dressing wounds. However, the overwhelming impediment to its widespread use has been a lack of shelf stability. HOCl is the most reactive ROS (Reactive Oxygen Species). This means it reacts very easily and will quickly turn back into saltwater.

Until recently, HOCl solutions would only remain stable for about 90 minutes before turning back into saltwater. eWater Hygiene Systems use a water electrolysis method for generating HOCl that generates a solution that remains stable for an extended period of time enabling it to be packaged and distributed.

Today HOCl products like eWater are used for food safe processing, hospital disinfection, wound healing and many other applications.

How eWater Disinfectant kills microbials

eWater use a technology called water electrolysis to generate a chemically activated solution containing a high concentration of Hypochlorous Acid with a high oxidising reduction potential (+800 mV to +1,200 mV).

HClO has a relatively low molecular weight it is better able than the other chlorine-based disinfectants to penetrate the cell walls. It also reacts more rapidly than other chlorine-based disinfectants to oxidation reactions with organic matter, i.e. the critical components of microbial cells. When immersed in these solutions, microorganisms are exposed to HOCl which will sequester electrons with high efficiency from microbial structural compounds and cause the rupturing of biochemical bonds and subsequent loss of function.

For this reason, it can achieve comparable pathogenic microorganism kill rates at a much lower like-for-like 'Part Per Million' (PPM) concentrations to conventional chemicals such as sodium hypochlorite.



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eWater vs Bleach

These two chemical solutions are very different but use the same active ingredient - Hypochlorous Acid to kill microorganisms.

Bleach

Sodium Hypochlorite (NaOCl), commonly known as bleach is widely recommended as an effective environmental disinfection chemical around the world, due to its low cost and wide distribution.

This chemical has a high pH (11+) and is produced at a high concentration in order to generate capable disinfection efficacy. When bleach is mixed with water, the pH is lowered (made acidic) converting a small percentage of the hypochlorite ion into hypochlorous acid. The hypochlorite ion is a relatively poor disinfectant relative to hypochlorous acid and due to this a high concentration of bleach is required to disinfect.

Bleach is a hazardous chemical that can cause skin irritations and react dangerously with other chemicals in our environment.

eWater

eWater contains only naturally formed hypochlorous acid generated from water electrolysis, using only salt, water and electricity. Containing a higher concentration of Hypochlorous Acid than found in bleach diluted at 1000ppm, research indicates that HOCl is 80 to 120 times more efficacious than sodium hypochlorite (bleach).⁵

Because HClO has a relatively low molecular weight it is better able than the other chlorine-based disinfectants to penetrate the cell walls. It also reacts more rapidly than other chlorine-based disinfectants to oxidation reactions with organic matter, i.e. the critical components of microbial cells. Conversely the hypochlorite ion is a relatively poor disinfectant because of its inability to diffuse through the cell wall.

For this reason, eWater can achieve comparable kill rates for viral and bacterial microorganisms at a much lower like-for-like 'Part Per Million' (PPM) concentration.

eWater is classed as a non-hazardous chemical that can be used safely without any personal protective equipment, leaves no chemical residue and naturally biodegrades ensuring no adverse environmental impact.

For more detail, please refer to the supplementary information provided on the following pages.



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Supplementary Information

Government Guidelines for use of Bleach

With the current COVID-19 pandemic government health departments are recommending the use of Chlorine based disinfectants and sanitisers. This recommendation is being made based on research demonstrating its effectiveness on killing Coronaviruses and other enveloped viruses.

As noted on Table 1 below from the Australian Department of Health, Sodium Hypochlorite commonly known as Bleach contains the active ingredient Hypochlorous Acid (HOCl).

Household bleach comes in a variety of strengths. The concentration of active ingredient — hypochlorous acid² — can be found on the product label.

Table 1. Recipes to achieve a 1000 ppm (0.1%) bleach solution

Original strength of bleach		Disinfectant recipe		Volume in standard 10L bucket
%	Parts per million	Parts of bleach	Parts of water	
1	10,000	1	9	1000 mL
2	20,000	1	19	500 mL
3	30,000	1	29	333 mL
4	40,000	1	39	250 mL
5	50,000	1	49	200 mL

²Hypochlorous acid (HOCl) is a weak acid formed when chlorine (Cl) dissolves in water and dissociated to hypochlorite (ClO⁻) which is the oxidising disinfectant in bleach.

Table 1 - Environmental cleaning and disinfection principles for COVID-19, Department of Health Australia

As discussed in this document, eWater contains a higher concentration of Hypochlorous Acid than in 1000ppm bleach solution (45-50ppm vs 15-25ppm) validating it as an effective Chlorine derived alternative to Bleach.



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International Recognition of the efficacy of Hypochlorous Acid

The following extract published by the CDC highlights that microbicidal activity of Chlorine Family disinfectants (of which both eWater and Bleach reside) is directly related to pH and HOCl – simply explained that a lower pH solution such as eWater (pH 3) shall have a strong disinfection efficacy due to the concentration of HOCl.

Guidelines for Disinfection and Sterilization in Healthcare Facilities

Published by The Centre for Disease Control and Prevention in the United States

<https://www.cdc.gov/infectioncontrol/guidelines/disinfection/>

“The microbicidal activity of chlorine is attributed largely to undissociated hypochlorous acid (HOCl). The dissociation of HOCl to the less microbicidal form (hypochlorite ion OCl-) depends on pH. The disinfecting efficacy of chlorine decreases with an increase in pH that parallels the conversion of undissociated HOCl to OCl-“

In addition, the World Health Organisation has also described this effect and highlights that Hypochlorite's (predominant in Bleach) require an excess concentration for disinfection relative to Hypochlorous Acid.

Environmental Health Criteria 216: Disinfectants and Disinfectant By-products Published by the World Health Organisation

https://www.who.int/ipcs/publications/ehc/ehc_216/en/

“Chlorine is used in the form of gaseous chlorine or hypochlorite (OCl-). In either form, it acts as a potent oxidizing agent and often dissipates in side reactions so rapidly that little disinfection is accomplished until amounts in excess of the chlorine demand have been added....”

“...Hypochlorous acid is a weak acid with pK_a of approximately 7.5 at 25 °C. Hypochlorous acid, the prime disinfecting agent, is therefore dominant at a pH below 7.5 and is a more effective disinfectant than hypochlorite ion, which dominates above pH 7.5.”

Research examples of the efficacy Electrolysed Oxidising Water (EOW) include the following:



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Research References

"The efficacy of EO waters on inactivating norovirus and hepatitis A virus in the presence of organic matter".

<https://doi.org/10.1016/j.foodcont.2015.09.011>

Key Findings:

- Acidic Electrolyzed Oxidizing Water was proven effective and generally killed more Murine Norovirus and Hepatitis A virus in suspension than Acidic Electrolyzed Oxidizing Water.
- Depending on the EO water generator, free chlorine concentrations are required to inactivate MNV-1 and HAV by 3-log PFU/mL or greater ranged from 30 mg/L to 40 mg/L after a 1 min contact time.
- Note that 30 mg/L = 30.03 PPM & 40 mg/L = 40.04 PPM

"Virucidal effect of acidic electrolyzed water and neutral electrolyzed water on avian influenza viruses."

<https://link.springer.com/article/10.1007%2Fs00705-013-1840-2>

Key Findings:

- The virucidal effects of two types of electrolyzed water, acidic electrolyzed water (AEW) and neutral electrolyzed water (NEW), on avian influenza viruses were studied.
- the virus titers decreased by >5 log at 1 min after the viruses were mixed with AEW, in which the concentration of the FAC ranged from 72 to 0 ppm. Thus, the virucidal effect of AEW did not depend on the presence of FAC.

Citation 5 -

"The Behavior of Chlorine as a Water Disinfectant"

<https://www.jstor.org/stable/41234959?seq=1>

G M Fair, et al. Journal American Water Works Association
1948 40 1051–1061

For further research reference please refer to our COVID-19 Guidance Paper issued 10 March 2020 available on our website.



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Supplementary Considerations

eWater Systems shall always take the associated effects of using synthetically produced chemicals into consideration when providing advice to customers. To this regard we note the following:

- eWater provides a unique benefit in that it is produced by an onsite generation system. In the extra ordinary situation that we are currently in, the ability to not rely on the commercial chemical supply chain is a significant benefit of the product.
- Both eWater solutions are far safer for both staff to handle and use. Notable not requiring any PPE. The associated risks of high concentrations of Chlorine are well reported and include coughing from the fumes, delirium, irritation, blistering and burning when put on the skin, stomach and abdominal pain if ingested.
- eWater is environmentally friendly with third party assurances certified by Australian Organics and GECA.