



Choosing a Sanitiser in the fight against infection

Safer and environmentally friendly, Eco-Lyte NTL (Anolyte) is unlike conventional sanitisers that are used for handwash, surface sanitising and food safety. It is produced from all-natural ingredients, is gentle on skin, safe for the environment and naturally biodegrades.

Anolyte kills bacteria and viruses using electrochemical properties. These properties act to breakdown and rupture cell membranes or viral surface proteins rapidly without the need for harsh conventional chemicals or alcohols. Beyond simple viral envelope denaturing, oxy-chlor components have also been proven to inactivate viral RNA up to x5 times more efficiently than Alcohol based sanitiser.

The key ingredient to Anolytes efficacy is electrochemically produced Hypochlorous acid – a wonder molecule our own bodies produce in response to infection. This biocompatibility with human cells means when using Anolyte around people, you are not introducing a foreign or harsh toxic chemistry but rather a mechanism for fighting infection that our bodies are aware of natively.

Considerations with Chemical Sanitisers

The world is not short on choice when it comes to sanitiser chemistry approved for disinfection; although, many of these chemical compounds raise concerns relating to worker & public health & safety, environmental impact and efficacy in dealing with a spectrum of microorganisms including emerging viral pathogens. Finding products that kill a particular bacteria or virus may not be that difficult, however using a product safely & effectively is the key consideration. The Occupational Safety & health Administration (OSHA) has a guiding principle – *“Don’t use hazardous chemicals if a less hazardous one is available”*. In other words, if there is a safer product to do the job, choose the safer one.

Some disinfectants ingredients (including quaternary ammonium compounds, hypochlorites and iodine-based compounds) are toxic and residue must be rinsed off.

In fact, quaternary ammonium compounds (QACs) are known to be a leading cause of contact dermatitis in the workplaces. Exposure to QACs, high %vol Alcohol products and hypochlorite's are known to cause other serious and preventable health effects. These may include:

- Triggering of asthma symptoms in people who already have asthma or new onset of asthma in people with no prior asthma.
- Eye and mucous membrane injuries from splashes or contact with mists, and
- Oral, gastrointestinal injuries & intoxication from swallowing solutions

To date no negative reports regarding dermal, ocular or mucous membrane related injuries or irritation have been reported to us or in scientific literature from users and experiments involving Anolyte HoCl at <500ppm. In fact Anolyte products in varying concentrations of active HoCl have been developed to deal directly with open wounds, burns, ocular infections and oral care.

How does it work – Anolyte mode of action

Anolyte is characterized by a marked deficiency of electrons. The fluid therefore has a tendency to strive for an electro-neutral condition by abstraction of electrons from the surrounding environment. If there are any micro-organisms in that environment, Anolyte abstracts the electrons from their membrane disrupting their balance and thereby causing their death. The production of oxidized and super-oxidized ions classifies Anolyte among the biocidal agents that give off oxygen. An important characteristic of this group of agents is rapid action and ecologically acceptable break down of its original components back to trace salt & water.

The core active ingredient in Anolyte; HoCl is neutral in charge and therefore disinfection kinetics take place, regardless of microorganism charge (+ or -). All of this destruction potential is limited to the "undesirables", whilst still being safe to human cells thanks to the chemistry being endogenous to our own biology. Unlike many other disinfectants, viruses & bacteria cannot build a tolerance or mutate therefore mitigating the risk of future resistance & creation of 'super-bugs'

What the scientific community say

Anolyte - HOCl has been recognised as a choice chemistry for disinfection programs in the event of epizootic disease outbreak. Applications include humane & animal medicine, food & beverage preparation, potable water treatment, medical facilities, equipment, schools, institutions and more. The ability to deal with a host of microorganisms including bacteria, viruses, spores, mold, fungi & yeasts without chemical residue side effects to the applicant or environmental occupants is what sets it apart from common disinfectants.

Electrochemical Anolyte solutions have been proven extensively with independent research and in commercial applications around the world. This powerful technology has been accepted & recognised by many national authorities including the Ministry of Health in Japan, NHS & ECHA in the UK, FDA & EPA in the United States and more globally, including multiple Organic approvals for use in food production, processing and personal care products.

Viricidal Efficacy

A well-documented virus for chemical efficacy tests is the Feline calicivirus (FCV) as it is relatively easy and safe to work with under laboratory conditions. Scientists use this virus as a "surrogate" for testing protocols aimed at deactivating pathogenic Norovirus. Both are non-enveloped viruses which are harder to kill than enveloped viruses such as Coronaviruses (*as per Spaulding classification method*).

A multitude of studies exist, showing inactivation of FCV by common disinfectants; acids, alcohols, ozone gas, hydrogen peroxide, sodium hypochlorite, and chlorine dioxide etc. Bleach and acid-based disinfectants can inactivate FCV within 1 min ($>4 \log_{10}$ reduction). Chlorine Dioxide gas by $>3 \log_{10}$ within 10 h and Ozone in less than 1 hour. Most of those compounds are toxic, require special handling and require extended contact void of personal or sensitive equipment. Hypochlorous acid at (150ppm representative of dilute Eco-Lyte NTL) achieved an impressive $>5 \log$ reduction in FCV in less than a minute. *

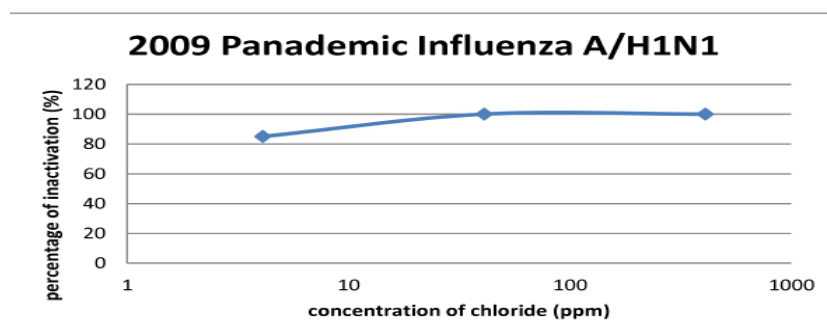
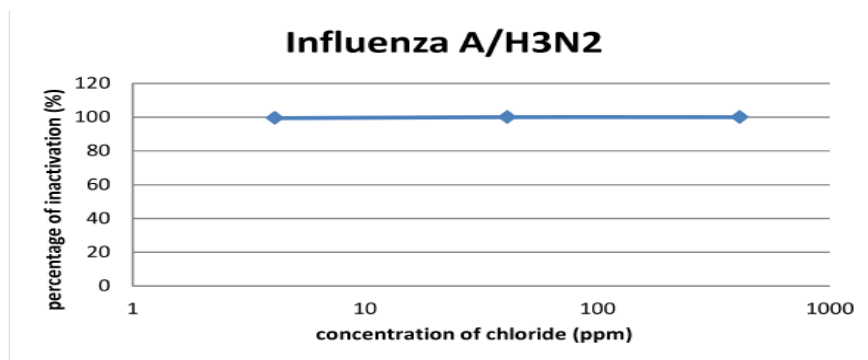
**Journals & reports available on request*

Microorganism Challenge Tests

Bacteria		Contact	Analyte Dilution			
		1/1	1/2	1/10	1/20	
<u>Acinetobacter baumannii</u>	1 min	-	-	-	+	
	2 min	-	-	-	+	
	5 min	-	-	-	-	
	10 min	-	-	-	-	
	30 min	-	-	-	-	
<u>E. coli</u>	1 min	-	-	-	+	
	2 min	-	-	-	+	
	5 min	-	-	-	+	
	10 min	-	-	-	-	
	30 min	-	-	-	-	
<u>Vancomycin reistant Enterococcus faecium</u>	1 min	-	-	-	+	
	2 min	-	-	-	+	
	5 min	-	-	-	-	
	10 min	-	-	-	-	
	30 min	-	-	-	-	
<u>Kiebsiella pneumoniae</u>	1 min	-	-	-	+	
	2 min	-	-	-	+	
	5 min	-	-	-	-	
	10 min	-	-	-	-	
	30 min	-	-	-	-	
<u>Pseudomonas aeruginosa</u>	1 min	-	-	-	+	
	2 min	-	-	-	+	
	5 min	-	-	-	-	
	10 min	-	-	-	-	
	30 min	-	-	-	-	
<u>Methicillian resistant Staphylococcus aureus</u>	1 min	-	-	-	+	
	2 min	-	-	-	+	
	5 min	-	-	-	-	
	10 min	-	-	-	-	
	30 min	-	-	-	-	
<u>Bacillus subtilis</u>	1 min	-	-	-	+	
	2 min	-	-	-	+	
	5 min	-	-	-	+	
	10 min	-	-	-	+	
	30 min	-	-	-	-	
<u>Myroides spp.</u>	1 min	-	-	-	+	
	2 min	-	-	-	+	
	5 min	-	-	-	-	
	10 min	-	-	-	-	

Viruses Challenge test

	Virus Control	Test	Inactivation Ration(%)
Influenza A/H1N1 (Seasonal)	8.32x10 ⁶ /mL	<100/mL	99.9988
Influenza A (H3N2)	4.8x10 ⁵ /mL	<100/mL	99.979
2009 pandemic influenza A/H1N1	2.7x10 ⁵ /mL	<100/mL	99.963
Influenza B	1.3x10 ⁶ /mL	<100/mL	99.992
HSV-1	1.155x10 ⁷ /mL	<100/mL	99.999
Enterovirus 71	TCID ₅₀ =10 ^{-4.6}	TCID ₅₀ <10 ⁻¹	99.98
Coxsackie virus B5	TCID ₅₀ >10 ⁻⁷	TCID ₅₀ <10 ⁻¹	99.9999
Echovirus 6	TCID ₅₀ =10 ^{-5.88}	TCID ₅₀ <10 ⁻¹	99.987
Adenovirus	TCID ₅₀ =10 ^{-5.4}	TCID ₅₀ <10 ⁻¹	99.996



Note the above successful virus inactivation's at dilutions of u to 1:100 or as low as 4ppm Active HoCl

Test studies & results available on request

See below some abstracts from peer reviewed literature available from Pubmed (*online database of studies on life sciences & biomedical topics*). References available on last page

Scientifically Anolyte is also referred to as Electrolyzed water, Super HOCl water & ECAS.

Hand Sanitising

1) The objective of this study was to compare the hand disinfectant effects between super hypochlorous water and 7.5% povidone-iodine. Subjects included thirty paediatric dentists The disinfectant effects of super hypochlorous water were significantly more effective than that of 7.5% povidone-iodine.

Viricidal Efficacy

2) Hypochlorous acid (HOCl) solutions were evaluated for their viricidal ability against a low pathogenic avian influenza virus (AIV), H7N1.....harvested solutions of HOCl after spraying could decrease the AIV titer by more than 1,000 times, to an undetectable level ($< 2.5 \log_{10} \text{TCID}_{50} / \text{ml}$) within 5 sec

Hospital Hygiene

3) Within the framework of the results of our study, we believe that electrolyzed water can be regarded as a cost-effective disinfectant that is successful in controlling hospital infections

Efficacy & Biocompatibility

4) ECAS is a broad-spectrum, non-selective biocide, Of particular note is its efficacy against *Cryptosporidium parvum*, a waterborne pathogen that has previously been shown to be resistant to standard chlorine treatment. pH-neutralised ECAS showed significant activity against *C. parvum* oocysts in contrast to little or no activity using a free chlorine solution.... The broad- spectrum antimicrobial activity of ECAS enables high- level disinfection as defined by the Centers for Disease Control and Prevention (CDC), and their favourable biocompatibility means that ECAS are ideally suited as both an environmental decontaminant and in the control or treatment of skin surface or mucous membrane infections.

Viricidal efficacy vs Sodium Hypochlorite (bleach)

5) In this study, in vitro bioassay showed that the electrolyzed solution abolished completely the infectivity of HIV-1. The possible mechanisms underlying this abolition are (1) inactivation of the surface protein, as observed in the experiments using HBsAg; (2) destruction of the envelope of the virus; (3) inactivation of viral enzymes; and (4) destruction of viral RNA.

Nath et al. (1982) indicated that partial inactivation of HBV DNA polymerase was observed in the presence of 2500 ppm of free chlorine at neutral pH. Rutala and Weber (1997) reported that the infectivity of HBV and HIV are abolished in the presence of 500 and 5000 ppm for 10 min and 1 min at room temperature, respectively. In the present study, the electrolyzed solution contained

only 4.2 ppm of free chlorine and showed greater efficacy against HBsAg and HIV-

Efficacy vs QAC's

6) Cleaning with electrolysed water reduced the mean surface bacterial load from 2.6 [interquartile range (IQR) 0.30-30.40] cfu/cm(2) to 0.10 (IQR 0.10-1.40) cfu/cm(2) [mean log(10) reduction factor 1.042, 95% confidence interval (CI) 0.79-1.30]. Cleaning with the in-use quaternary ammonium disinfectant increased the bacterial load from 0.90 (IQR 0.10-8.50) cfu/cm(2) to 93.30 (IQR 9.85-363.65) cfu/cm(2) (mean log(10) reduction -1.499, 95% CI -1.87 to -1.12) (P < 0.0001). Using two proposed benchmark standards for surface microbial levels in hospitals, electrolysed water resulted in a higher 'pass rate' than the in-use quaternary ammonium disinfectant (80-86% vs 15-21%, P < 0.0001).

CONCLUSION:

Electrolysed water exerts a more effective bacterial kill than the in-use quaternary ammonium disinfectant, which suggests that it may be useful as a surface sanitizer in environments such as care homes.

In Vivo Toxicity Tests

7) Zebrafish embryo assays were used to evaluate acute toxicity. Results: All the HOCl or NaOCl treatment groups showed > 99.9% antibacterial efficacy against Enterococcus faecalis and Streptococcus mutans. Zebrafish embryos showed almost complete dissolution in 1.5% NaOCl within 5 min. Both survival rates after being treated with 0.0125% and 0.0250% HOCl for 0.5 min or 1.0 min were similar to that of E3 medium*. Conclusions: Both NaOCl and HOCl revealed similar antibacterial efficacy (> 99.9%) against Enterococcus faecalis and Streptococcus mutans. While 1.5% NaOCl fully dissolved the Zebrafish embryos, both 0.0125% and 0.0250% HOCl showed little in vivo toxicity, affirming its potential as an alternative irrigation solution for vital pulp therapy.

*(electrolyte/saline water)

Biocompatibility studies

Electrochemically produced HOCl has gone through biocompatibility studies* in various labs to show its safety and compatibility in human cells. No adverse effects, toxicity or irritation have been shown based on the following panels

ISO Acute Dermal Toxicity Study (ISO 10993- 11:2010(E))
 ISO In Vivo Studies: Intracutaneous Reactivity Test (ISO 10993- 10:2010(E))
 ISO In Vivo Studies: Primary Skin Irritation Test (ISO 10993- 10:2010(E))
 ISO Genotoxicity Studies: In vitro Micronucleus Assay (ISO 10993- 3:2010(E))
 ISO Cytotoxicity Studies: MTT Assay (ISO 10993- 5:2009(E))
 ISO Skin Sensitization Study-Guinea-Pig Maximization Test Extract - Freund's Complete Adjuvant and distilled water (DIN EN ISO 10993- 10:2007(E))
 ISO Ocular Irritation Study in Rabbits (DIN EN ISO 10993- 10:2007(E))
 ISO Vaginal Irritation Study in Rabbits (DIN EN ISO 10993- 10:2007(E))a
 ISO Acute Oral Toxicity Study in Rodents (ISO 10993- 11:2010(E))
 ISO Acute Inhalation Toxicity Study (OECD guideline No.403 (Tradition Protocol); adopted on September 07, 2009)

*3rd party reporting, information available in the public domain

Dr Robin Kirkpatrick, a South African Microbiologist, researcher and developer of Anolyte applications into some of South Africa's largest food & beverage producers has this to say on Anolyte – HOCl safety.

“Hypochlorous acid (HOCl) has long been established as one of the core components of the physiological response by mammalian inflammatory systems to counter the adverse challenges of invading infectious agents. Electrochemically Activated (ECA) water solutions, in particular the oxidising Anolyte solution produced by dedicated Electrolysis systems offers a substantially physiological equivalent analogue to assist in the control of invasive infectious agents including bacteria, viruses and fungi.

The Anolyte solutions of consistently quality assured and approved production systems have been widely documented in peer reviewed scientific journals as being an effective decontaminating and sanitising agent for infected contact surfaces.

In addition, and in support of the already vast body of mammalian compatibility studies, there are a growing number of reports that have indicated the benefits of using the Anolyte solution at a variety of measured dilutions for treatment and decontamination of infected tissues including hands. Furthermore the widely reported use of Anolyte to decontaminate the irrigant solutions in dental water lines confirms the safety of Anolyte use within the mouth and by extension as a mouth wash to reduce infectious microbes in the oral cavity. ”

References

- 1} PEDIATRIC DENTAL JOURNAL 14(1): 1–3, 2004 . Comparison of the hand disinfectant effects between super hypochlorous water and 7.5% povidone-iodine
Michiko Nishimura, Naoyuki Kariya, Ullmannemekh Hulan, Chun Yan Duan and Tsutomu Shimono Department of Behavioral Pediatric Dentistry, Graduate School of Medicine and Dentistry, Okayama University 2-5-1 Shikata-cho, Okayama 700-8525, JAPAN
- 2} Hakim, Hakimullah & Thammakarn, Chanathip & Suguro, Atsushi & Ishida, Yuki & Kawamura, Akinobu & Tamura, Miho & Satoh, Keisuke & Tsujimura, Misato & Hasegawa, Tomomi & Takehara, Kazuaki. (2014). Evaluation of sprayed hypochlorous acid solutions for their virucidal activity against avian influenza virus through in vitro experiments. The Journal of veterinary medical science / the Japanese Society of Veterinary Science. 77. 10.1292/jvms.14-0413.
- 3} Yanik K, Karadag A, Unal N, Odabasi H, Esen S, Gunaydin M. An investigation into the in-vitro effectiveness of electrolyzed water against various microorganisms. Int J Clin Exp Med. 2015;8(7):11463–11469. Published 2015 Jul 15. n controlling hospital infections
- 4} Electrochemically activated solutions: evidence for antimicrobial efficacy and applications in healthcare environments R. M. S. Thorn & S. W. H. Lee & G. M. Robinson & J. Greenman & D. M. Reynolds
- 5} Journal of Virological Methods 85 (2000) 163–174 Disinfection potential of electrolyzed solutions containing sodium chloride at low concentrations
Chizuko Morita a, Kouichi Sano a,*, Shinichi Morimatsu a, Hiromasa Kiura a,b, Toshiyuki Goto a, Takehiro Kohno a, Wu Hong a, Hirofumi Miyoshi c, Atsuo Iwasawa d, Yoshiko Nakamura d, Masami Tagawa e, Osamu Yokosuka e, Hiromitsu Saisho e, Toyoyuki Maeda f, Yoji Katsuoka
- 6} [J Hosp Infect.](#) 2012 Feb;80(2):122-7. doi: 10.1016/j.jhin.2011.10.015. Epub 2011 Dec 21.
Comparison of cleaning efficacy between in-use disinfectant and electrolysed water in an English residential care home.
[Meakin NS](#)¹, [Bowman C](#), [Lewis MR](#), [Dancer SJ](#).
- 7} The Antibacterial Efficacy and In Vivo Toxicity of Sodium Hypochlorite and Electrolyzed Oxidizing (EO) Water-Based Endodontic Irrigating Solutions. Sung-Chih Hsieh 1 , Nai-Chia Teng 1 , Chia Chun Chu 2 , You-Tai Chu 2 , Chung-He Chen 2 , Liang-Yu Chang 2 , Chieh-Yun Hsu 2 , Ching-Shuan Huang 1 , Grace Ying-Wen Hsiao 1 and Jen-Chang Yang