

# The Application of Electrolyzed Water as a Cleaner/Sanitizer/Disinfectant





*Presented by*

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# Outline

- Overview of Electrolyzed Water
- Critical Elements
- Application
- Sample Uses
- Advantages
- Disadvantages
- Regulatory Requirements and Approvals
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# Electrolyzed Water (EW)

- Electrolyzed water is an all-natural, organic, non-toxic, environmentally, and ecologically safe cleaning, sanitizing, and disinfecting solution.
- It is produced from the electrochemical reaction of water, salt, and electricity.
- The reaction products include sodium hydroxide (NaOH) and hypochlorous acid (HOCl)
- This scientific process dates back to the early 1900's
- Electrolyzed water is also known as:
  - electrolyzed oxidizing water
  - electro-activated water
  - electro-chemically activated water solution

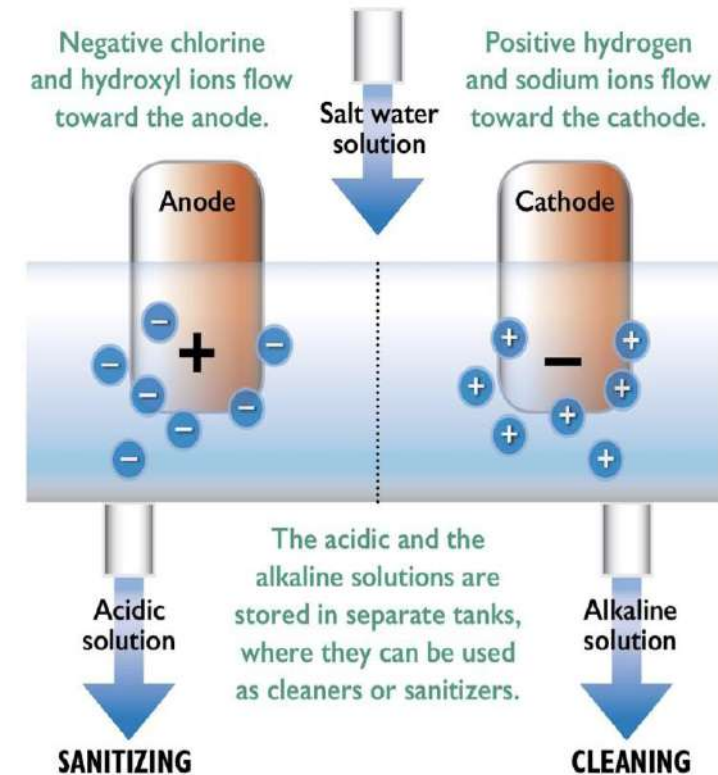
# Principle of Electrolyzed Water

Water and salt are passed through a patented electrolysis membrane.

An electro-chemical reaction creates two distinct solutions.

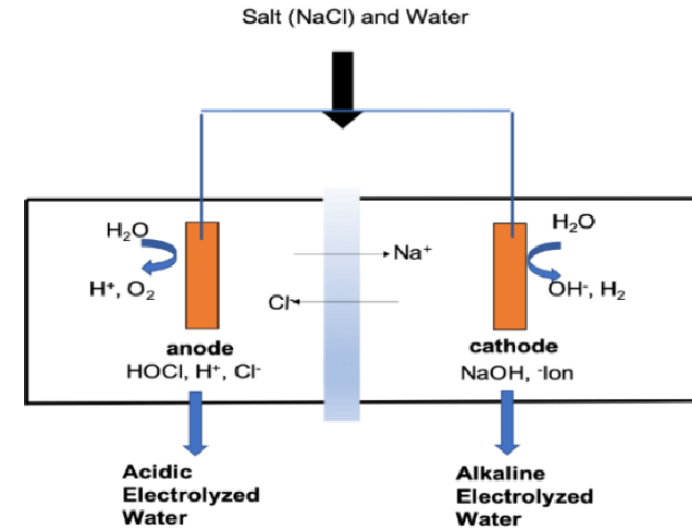
**Sodium Hydroxide (NaOH) = cleaner / degreaser**

**Hypochlorous Acid (HOCL) = sanitizer / disinfectant**



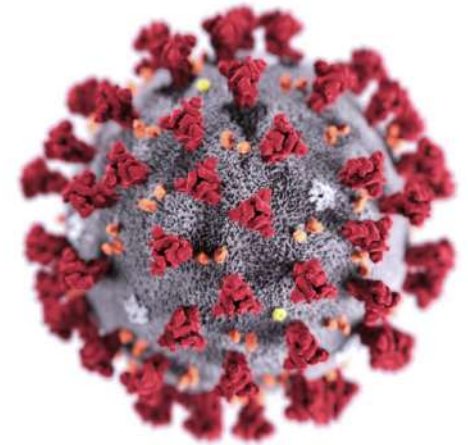
# Sodium Hydroxide (NaOH)

- Sodium is positively charged, thus attracted to the negative charge, where it also bonds with oxygen and hydrogen and is electrochemically converted to sodium hydroxide (NaOH).
- NaOH is a very powerful degreaser and cleaner.
- NaOH can break down proteins, fats, and organic materials like bio-films and molds, and it easily removes soaps.
- It is EPA, FDA, and USDA approved



# Hypochlorous Acid (HOCl)

- When an electrical charge is passed through a salt (NaCl) solution, the sodium (Na) separates from the chloride (Cl)
- Chloride is negatively charged, and is attracted to the positive side of the electrical charge where it bonds with oxygen and hydrogen from the water.
- It then gets converted to hypochlorous acid (HOCl), which **strong sanitizing / disinfecting solution.**
- HOCl is a biocide, effective against a spectrum of pathogens in less than 10 seconds of contact time
- **It is on the EPA's list of disinfectants effective against Coronavirus (COVID-19)**
- It is also FDA and USDA approved



# Critical Elements

## Salt

Salt level must be maintained so the system has a ready supply available at all times.

## pH

pH must be tested daily, as the pH determines whether the solution is at the right concentration of HOCl to meet EPA requirements to be registered as a disinfectant.

## Chlorine

EW is a chlorine-based solution, approved by EPA for use at concentrations of up to 200 ppms. Must be tested daily to ensure that it meets the manufacturers recommendations.



# Monitoring Critical Elements

Monitoring results should be recorded daily.

	Electrolyzed Water Daily Check List				
Day	Date	pH	Chlorine	Was salt added?	Checked by (Initial)
Monday				Y   N	
Tuesday				Y   N	
Wednesday				Y   N	
Thursday				Y   N	
Friday				Y   N	
Saturday				Y   N	
Sunday				Y   N	

# Application Requirements

## CLEAN

### Step 1

Thoroughly  
wipe down area  
with **CLEANING**  
solution.



## SANITIZE/DISINFECT

### Step 2

Using a clean wiping cloth,  
spray bottle, pump sprayer,  
or electrostatic sprayer,  
**SANITIZE/DISINFECT** the  
designated surface

***Surfaces must be cleaned before they can be sanitized / disinfected***

# EW Sample Uses

- Cleans - food and non-food contact surfaces
- Degreases food and non-food contact surfaces
- Streak-free glass cleaner because of absence of soap residue
- Hand sanitizer
- Extends shelf life of cut flowers
- Floor & carpet cleaner
- Disinfects - non-food contact surfaces, like kitchen equipment, sinks, counters, bathroom fixtures (& removes soap scum), banisters, door knobs, telephones, key pads, golf carts, steering wheels, sporting equipment, health facility equipment (while being safe for skin), laundry linens when applied during final rinse cycle, draperies, upholstery, floors, walls, etc.
- Can be applied to misters to deodorize and disinfect the air

# Advantages of EW

- Produced in an environmentally friendly manner from table salt (NaCl) and distilled water. Returns to its normal form after use and poses no threat to humans and the environment.
- Ability for on-site production, circumventing problems associated with storage, transportation, and handling of dangerous chlorine.
- Active against a broad spectrum of bacteria and possesses nonselective antimicrobial properties.
- Exhibits strong bactericidal, fungicidal, and virucidal effects in various sectors, including, food, agriculture, and the medical industry.
- Enhances shelf life, and food quality.
- Can reduce health hazards for workers by eliminating the need to handle concentrated chemicals.

# Disadvantages of EW

- Not effective in hard water (need initial water testing).
- Requires electricity for production – electrical surges or outages affect output & may require the system to be reset.
- Reduction in concentration of chlorine over time, which reduces bactericidal activity (shelf life of several weeks to a month if stored in a closed container, out of direct sunlight).
- Discomfort to operator caused by pungent chlorine gas generated by **some** EOW generators when operated at a pH of <5 (need good ventilation).
- Reduction in antimicrobial activity by inappropriate storage, and the presence of organic matter (must be covered).
- Salt based product, salt can be corrosive over time if not wiped off the surface.
- Many people doubt its efficacy when they use it for the first time, so they have a tendency to mix it with other chemicals. *EW solutions must never be diluted with water, or be combined with any other chemicals.*

# Regulatory Requirements

- **105 CMR 590.008 (E), 2013 FDA Food Code (FC) 8-304.15** *Notification of Changes*  
This section was added after FC 8-304.11 during the latest regulatory update (10/2018)
- **FC 4-501.114** *Manual & Mechanical Warewashing Equipment, Chemical Sanitization – Temperature, pH, Concentration, & Hardness*
- **FC 4-703.11 (C)** *Hot Water and Chemical*
- **FC 7-204.11** *Sanitizers, Criteria*

# Regulatory Requirements Cont'd.

## 105 CMR 590.008 (E), FC 8-304.15 *Notification of Changes*

**Installing an electrolyzed water system would be considered a new operation, requiring approval from the board of health.**

In addition to requirements set forth in FC 8-304.11 *Responsibilities of the Permit Holder*, the permit holder shall:

- (A) Notify the board of health within 48 hours after any change in ownership, and at least 30 days prior to any change of the name, location of the food establishment, or ***addition of a new operation*** and shall promptly submit to the board of health an application for a new or amended permit, ***together with written documentation reflecting such change.***
  
- (B) Submit plans in accordance with FC 8-2 Plan Submission and Approval any time an establishment is being remodeled ***or a new operation added*** and shall promptly submit to the board of health an application if a new or amended permit is required."

NOTE: This section was added after FC 8-304.11 during the latest regulatory update (October of 2018).

Once documentation is submitted, the BOH would review for compliance. The onus is on the operator to

# Regulatory Requirements Cont'd.

**FC 4-501.114** *Manual and Mechanical Warewashing Equipment, Chemical Sanitization – Temperature, pH, Concentration, and Hardness*

A chemical sanitizer used in a sanitizing solution for a manual or mechanical operation at **contact times** specified under

**FC § 4-703.11(C)** *Hot Water and Chemical* contact times shall be shall meet the criteria specified under **FC § 7-204.11** *Sanitizers, Criteria (40 CFR 180.940)*, shall be used in accordance with the EPA registered label use instructions, and shall be used as follows: → *next slide*

# Regulatory Requirements Cont'd.

## FC Section 4-501.114 (A) and (D)

- EW devices generate chlorine, which, according to the 2013 FDA Food Code (FC), 4-501.114 (A) must have a specific concentration range, pH, and temperature based on the concentration and pH of the solution as listed on the chart in that section. The maximum concentration for chlorine in that section is 100 ppms.
- Section (D) of this same regulation states: If another solution of a chemical specified under ¶¶ (A) - (C) of this section is used, the permit holder shall demonstrate to the regulatory authority that the solution achieves sanitization and the use of the solution shall be approved.
- However, under 40 CFR 180.940, *when ready for use, EPA allows the end-use concentration of hypochlorous acid chemicals in the solution to reach up to 200 ppms (determined as total available chlorine).*

# Regulatory Requirements Cont'd.

## FC § 4-501.114 Section (F), Parts (A) - (D)

If a chemical sanitizer is generated by a device located on-site at the food establishment, it shall be used as specified in FC § 4-501.114, Parts (A) - (D) and, under section (F) shall be produced by a device that:

1. Complies with regulation as specified in §§ 2(q)(1) and (12) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
2. Complies with 40 CFR 152.500 *Requirement for Devices* and 40 CFR 156.10 *Labeling Requirements*
3. Displays the EPA device manufacturing facility registration number on the device
4. Is operated and maintained in accordance with manufacturer's instructions

### NOTE:

**Annex 3** of the 2013 FDA Food Code - *Public Health Reasons/Administrative Guidelines* - section **4-501.114** has more detailed information about these type of devices.

# Pesticide Devices

A device used to generate hard food contact surface sanitizers on-site is considered a pesticide device. The Environmental Protection Agency (EPA) defines a device in 40 CFR 152.500, *Requirements for Devices* as....

*“any instrument or contrivance (other than a firearm) intended for trapping, destroying, repelling, or mitigating any pest or any other form of plant or animal life (other than man and other than a bacterium, virus, or other microorganism on, or in living man or living animals) but not including equipment used for the application of pesticides (such as tamper-resistant bait boxes for rodenticides) when sold separately therefrom”*

*A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.*

We tend to think of pesticides when we think of getting rid of ants, or cockroaches, but germs are also pests and the products used to kill them are considered pesticides.

# Regulatory Requirements Cont'd.

## *FC - 7-204.11 Sanitizers, Criteria*

Chemical sanitizers, including chemical sanitizing solutions generated on-site, and other chemical antimicrobials applied to food contact surfaces

(A) Must meet the EPA requirements specified in **40 CFR §180.940** *Tolerance exemptions for active and inert ingredients for use in antimicrobial formulations (food-contact surface sanitizing solutions)*

Residues of hypochlorous acid are exempted from the requirement of a tolerance when used in accordance with good manufacturing practice as ingredients in an antimicrobial pesticide formulation, provided that the substance is applied on a semi-permanent or permanent food-contact surface with adequate draining before contact with food and the end use concentration of the HOCl chemicals in solution do not exceed 200 ppms

# FDA and Electrolyzed Water (EW)

- FDA cleared electrolytically generated hypochlorous acid (HOCl) as a high-level disinfectant in 2002 (*FDA personal communication, September 18, 2002*)
- FDA approved sanitizer that meets 21 CFR §178.1010
- FDA approved under 21 CFR §173.315 for direct contact with processed foods
- FDA approved for several indirect food contact applications under 21 CFR, sections 172.892, 175.105, 176.170, and 177.2800
- FDA decision #692 allows for vegetable & fruit produce washing using electrolyzed water
- FDA approved under 21 CFR §7120.1 for spray and water treatment for processing of beef, poultry & pork

# EPA and Electrolyzed Water



Under 40 CFR §180.940, EPA granted approval for washing raw foods that are to be consumed without processing, *provided that*

- the electrolyzed water is applied on a semi-permanent or permanent food-contact surface *and*
- has adequate draining before contact with food *and*
- the end use concentration of the HOCl chemicals in solution do not exceed 200 ppms determined as free available chlorine.

# USDA and Electrolyzed Water



Electrolyzed water is a type of chlorine material that is allowed in organic production and handling.

Policy Memorandum - September 11, 2015

This memorandum updates the status of electrolyzed water under the U.S. Department of Agriculture (USDA) organic regulations at 7 CFR Part 205. The memorandum clarifies that electrolyzed water is a type of chlorine material that is allowed in organic production and handling. This memorandum replaces PM 14-3.

The National Organic Program (NOP) Handbook includes guidance (NOP 5026) *The Use of Chlorine Materials in Organic Production and Handling*. This guidance clarifies the allowable uses of chlorine products under the USDA organic regulations.

# References

- Ayebah, B., Hung, Y.C. (2005). Electrolyzed water and its corrosiveness on various surface materials commonly found in food processing facilities. *Journal of Food Process Engineering*, 28, 247–264.
- Merged Food Code (U.S. Public Health Service 2013 FDA Food Code, with 2015 Supplemental Regulations, and 105 CMR 590.000).
- U.S. Public Health Service Food Code 2013 Annex 3
- Robert W. Powitz (2010). Activated and electrolyzed water: a brief review of a new generation of cleaners and sanitizing agents.
- SME Rahman, Imran Khan, Deog-Hwan Oh (2016). Electrolyzed water as a novel sanitizer in the food industry: current trends and future perspectives. *Comprehensive Reviews in Food Science and Food Safety*, 15, 471-490.
- **Centers for Disease Control & Prevention (CDC)** - *Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008 (Update: May 2019)* William A. Rutala, Ph.D., M.P.H.1,2, David J. Weber, M.D., M.P.H.1,2, and the Healthcare Infection Control Practices Advisory Committee (HICPAC)3
- **Environmental Protection Agency (EPA)** - *Determining if a cleaning product is a pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act? (FIFRA)*
- USDA Memorandum – 9/11/15 - PM 15-4 Electrolyzed Water Rev01

# Contact Information

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*Thank  
You!*

**Any Questions?**