



Free Available Chlorine
VS
Combined Chlorine

Know your pH

Common Terms used in Chlorine Chemistry

Understanding the 3 chlorine types

To understand the differences between free, combined and total chlorine, first take a look at this simple formula:



- ◇ Free Chlorine
- ◇ Combined Chlorine
- ◇ Total Chlorine

Free Chlorine

Free chlorine is the chlorinated water that has not interacted with any contaminants.

Free chlorine is non-reacted hypochlorous acid, HOCl

Combined Chlorine

Combined chlorine is the chlorine that has been already been “used up” in the sanitizing process. When Free Chlorine reacts with organic material i.e., fats, blood, Free Chlorine forms chloramines or chlorimides. Any chlorinated product that is the result of a reaction of Free Chlorine is considered “Combined”.

Total Chlorine

Total chlorine is simply the sum of the free and combined chlorine

Does HOCl kill Salmonella?

Yes!

According to FCN 1811

Free chlorine not to exceed 50 ppm in process water or ice which comes into contact with food as a spray, wash, rinse, dip, chiller water, and scalding water for whole or cut meat and poultry, including carcasses, parts, trim and organs;

- pH range for all applications is 4.0 – 9.0;
- Contact/dwell time for spray, wash, rinse, dip; 1 – 120 seconds;
- Dwell time chiller water: 10 seconds to 120 minutes; and
- Pressure for spray: 5-100 psi.

Free chlorine not to exceed 50 ppm in process water, ice, or brine used for washing, rinsing, or cooling of processed and pre-formed meat and poultry products as defined in 21 CFR 170.3(n)(29) and 21 CFR 170.3(n)(34), respectively;

- pH range for all applications is 4.0 – 9.0;
- Contact/dwell time for spray, wash, rinse, dip: 1 – 120 seconds;
- Pressure for spray: 5 – 100 psi.

..an aqueous solution of hypochlorous acid, as an antimicrobial in the production of whole or cut meat and poultry... USDA Dec 19, 2018

Studies that show HOCl
is effective against :

- Salmonella,
- E.Coli
- And Listeria

Efficacy of Electrolyzed Oxidizing Water for Inactivating
Escherichia coli O157:H7, *Salmonella enteritidis*,
and *Listeria monocytogenes*

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FULL PAPER *Avian Pathology*

**Evaluation of sprayed hypochlorous acid solutions for their virucidal activity against
avian influenza virus through *in vitro* experiments**

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Hypochlorous Acid Handling

Identification of Petitioned Substance

Chemical Names: Hypochlorous acid,
hypochloric (I) acid, chloranol,
Hydroxidochlorine

Other Name: Hydrogen hypochlorite,
Chlorine hydroxide

Trade Names: Bleach, Sodium hypochlorite,
Calcium hypochlorite, Sterilox, hypochlorite,
NVC-10

CAS Numbers: 7790-92-3

Other Codes: European Community
Number-22757, IUPAC-Hypochlorous acid

List other codes: PubChem CID 24341

InChI Key: QWPPOHNGKGFJK-
UHFFFAOYSA-N

UNII: 712K4CDC10

7 The USDA's Food Safety and Inspection Service Directive 7120.1 "Safe and Suitable Ingredients 228 Used in the Production of Meat and Poultry Products", has approved the use of electrolytically 229 generated hypochlorous acid as a food additive for use on meat and poultry products. It is 230 allowed for use on red meat carcasses down to a quarter of a carcass, **whole or eviscerated 231 poultry carcasses, in water used in meat and poultry processing**, in poultry chiller water, for 232 reprocessing contaminated poultry carcasses, on giblets and salvaged parts, and on beef primal 233 cuts of beef. Depending on the product sanitized from 5 to 50 ppm free available chlorine can be 234 used