



The University of Georgia

Cooperative Extension Service

College of Agricultural and Environmental Sciences / Athens, Georgia 30602-4356

NOVEMBER 2007



PROCESSING TIP . . .

CHLORINE IS STILL THE MOST POPULAR SANITIZER IN THE POULTRY INDUSTRY (PART 1)

Introduction

Chlorine in the form of sodium hypochlorite, calcium hypochlorite tablets or chlorine gas is by-far the most commonly used carcass and equipment disinfectant in the U.S. poultry industry. The USDA, Food Safety and Inspection Service (FSIS) allows for addition of chlorine to processing waters at levels up to 50 ppm in carcass wash applications and chiller make-up water. The FSIS also requires that chlorinated water containing a minimum of 20 ppm available chlorine be applied to all surfaces of carcasses when the inner surfaces have been reprocessed (due to carcass contamination) other than solely by trimming.

With recent emphasis by USDA-FSIS on further reducing *Salmonella*, poultry plants have increased their reliance on the water chlorination program in the processing plant including pre-scald bird brushes, equipment rinses, inside/outside bird washers, carcass washes, and as a disinfectant during chilling. However, there remains a limited understanding of water chlorination and proper management of water chlorination in the poultry industry. Thus, a review of chlorination is needed.

At recommended levels, hypochlorite (chlorine derivative) based sanitizers reduce enveloped and non-enveloped viruses. Chlorine is also effective against fungi, bacteria, and algae. However, under traditional conditions of use, chlorine does not affect bacterial spores. Chlorine was first used in water treatment by the municipal water treatment facilities in Chicago and Jersey City in 1908. Chlorine is used in three common forms for water treatment: elemental chlorine (chlorine gas), sodium hypochlorite (bleach) solution and dry calcium hypochlorite pellets. The amount of hypochlorite (OCl^-) varies depending on the type of chlorine used. One pound of Cl_2 generates an amount equal to one gallon of 12.5% NaOCl , and 1.5 pounds of $\text{Ca}(\text{OCl})_2$ (65%).

Types of chlorine used in the poultry industry

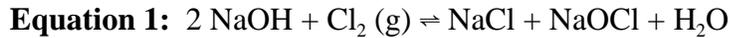
Chlorine gas

Chlorine in its elemental state is a halogen gas (Cl_2) which is highly toxic and corrosive. Because of safety concerns with chlorine gas, many food processing facilities have changed to either sodium hypochlorite or calcium hypochlorite for water treatment.

Chlorine gas and sodium hypochlorite (NaOCl) can be produced in an electrochemical process depending on the process conditions (Equation 1). For NaOCl production, Cl_2 gas is

PUTTING KNOWLEDGE TO WORK

passed through sodium hydroxide solution (NaOH). The NaOH reacts with the Cl₂ to produce NaCl, NaOCl and water as shown below.



Sodium hypochlorite

In most food plant applications, chlorine is purchased as sodium hypochlorite (NaOCl) solution. Sodium hypochlorite solutions used in poultry processing contain between 5 and 12% pure sodium hypochlorite. Household bleach typically contains 5.25% NaOCl. It should be noted that household cleaners and sanitizers are not acceptable for USDA-FSIS inspected food plants unless accepted by USDA. Commercial forms of sodium hypochlorite are provided in a range of concentrations from 3-50%. The most commonly used form in poultry processing plants is commercial bleach which contains 12.5% NaOCl. This is the most common or popular form of chlorine used in poultry plants worldwide.

Calcium hypochlorite

Available in granular or pellet form, calcium hypochlorite is generally more expensive to use than other hypochlorite forms. Some companies use calcium hypochlorite because the concentration can be controlled more effectively than other forms of chlorine used.

Chlorine based sanitizers are low in cost and can control bacteria in food processing plants when used appropriately. The advantages and disadvantages to using chlorine sanitizers are listed in Table 1.

Table 1. The advantages and disadvantages of sodium hypochlorite use in poultry processing.

Advantages	Disadvantages
Low cost	Activity greatly influenced by pH (optimum is below 6.5)
Familiar – proven technology	Irritating agent
Relatively non-toxic	Inactivated by organic matter
Wide germicidal activity	Less active at low temperature
Effective at low concentrations	Carcinogenic byproducts
Bacteria cannot become resistant	High corrosivity
Kills bacteria in more than one way	Carcasses treated with chlorine not accepted by Canada and Europe


 Scott M. Russell, Ph.D.
 Extension Poultry Scientist

Extension County
 Coordinator/Agent

“Your local County Extension Agent is a source of more information on this subject.”