

# The Effectiveness of Chlorine Dioxide in Inactivating Influenza Virus

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## Abstract:

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National outbreaks of avian influenza type A viruses have been the source of a wide range of adverse effects for the country. Not only do the deadly outbreaks lead to the culling of thousands of birds, economic damage to commercial farms, increased product prices, and blocked international trade, but there is also concern for human health, as some viruses have the ability to mutate and change from their usual host. The solution to the avian influenza outbreaks would be to find an efficient way to control and prevent pathogenic viruses from entering the chicken farms and causing disease. Currently, this solution does not exist on a large scale. Chicken or other poultry farms house thousands of birds in a small of area, so transmission is rapid and almost unavoidable once the virus is introduced. This study follows an approach using the chemical compound chlorine dioxide to treat and disable influenza viruses. Chlorine dioxide is known to have antibacterial and antiviral activity and is used as a disinfectant in a wide variety of settings, including military and medical. In order to test the effects chlorine dioxide has on influenza viruses, this study exposed seven different strains of influenza to chlorine dioxide gas. Among the strains used, two avian strains, two human strains, and three swine strains were tested. Each strain was exposed to different concentrations of chlorine dioxide, ranging from 50 parts per million to 500 parts per million, and exposed for different durations of time, ranging from 30 minutes to 4 hours. Each specific set of conditions was repeated three times. A hemagglutination assay was conducted after each trial to determine the viral titer. The effectiveness of each treatment depended on the length of exposure and the concentration. The treatments with a lower concentration iv consistently inhibited the hemagglutinin protein completely when treated for four hours. As the concentrations increased, the length of exposure necessary to bring the virus titer to zero decreased. When completing trials with 500 parts per million, the assay showed complete hemagglutinin inhibition and therefore protection for influenza viruses in just thirty minutes of exposure. These results show that chlorine dioxide has high potential for a successful preventative treatment in poultry flocks. The granular form, which involves the chlorine dioxide compound and an oxidizing agent, is more advantageous than other methods of distributing chlorine dioxide treatment. This method of release for chlorine dioxide could be directly placed beneath the floor of poultry farm cages and be used as an ongoing method of prevention. These results show potential for the use of chlorine dioxide in this field.

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