Landscapes & Calcium Hypochlorite

by Dr. Kim D. Coder, School of Forest Resources University of Georgia June, 2004*

Calcium hypochlorite ($CaCl_2O_2$) is a chemical compound which is quite common in our lives. It is a defender of our health and used for a variety of different uses. Sometimes this chemical escapes from normal use and becomes potentially damaging in the environment and within landscapes. This publication is a general introduction to the chemical compound and to human impacts from contact. This is not a first aid outline or toxicity information review. Seek immediate medical assistance if exposed, and review all regulatory and safety data sheets for this compound before use.

Judging By Its Character

Calcium hypochlorite is a common, manufactured, chlorine-containing product used for disinfection of water, such as for swimming pool sanitation. Calcium hypochlorite is a white solid at room temperature. Calcium hypochlorite is heavier than water and quite soluble. It decomposes in water, or when heated past 210°F, and forms oxygen and chlorine. It has a chlorine odor. Calcium hypochlorite is an artificial compound, not occurring in nature. Accidents and improper use of calcium hypochlorite can cause short-term, high concentration exposures to chlorine gas in a landscape. Leaks around water treatment plants and swimming pools are extremely rare but have occurred.

Intense Reactions

Calcium hypochlorite is an oxidizing chemical, allowing combustible materials to burn well. It is not flammable itself, but can react explosively with ammonia, amines, carbon-tetrachloride, charcoal, oils, organic sulfides, sulfur, and thiols. Metal oxides help catalyze the chemical decomposition of calcium hypochlorite. Contact with alcohols, glycols, glycerols, and phenols can result in ignition. Calcium hypochlorite should be stored in a dry, ventilated area below 120°F. Acids, ammonia, amines, other chlorinating agents, and other types of oxidizing compounds should be removed from the area.

Water Water Everywhere

Calcium hypochlorite ($CaCl_2O_2$) added to water generates a calcium ion (Ca^{++}) and two hypochlorite ions (OCl^-). The hypochlorite ions are in a pH dependent equilibrium with hypochlorous acid (HOCl) in water. This water solution is found in household bleach. Most drinking water systems use a hypochlorous acid concentration of around 0.6ppm for disinfection. Other names used for calcium hypochlorite include hypochlorous acid, calcium chlorohydrochlorite, calcium salt, chlorinated lime, lime chloride, calcium oxychloride, and perchloron.

Great Escape

When exposed in the environment, calcium hypochlorite breaks apart due to interactions with sunlight and the atmosphere. In the soil, calcium hypochlorite breaks apart into calcium ions and hypochlorite ions. These ions can interact with many different soil and water constituents. Iron, manganese and nitrites can be oxidized by chlorine. The chlorine combines with organic materials in the soil water including nitrogen containing materials. With increasing concentrations of chlorine, the chlorine containing nitrogen compounds are broken down into hydrochloric acid and nitrogen gas. Calcium hypochlorite or chlorine does not accumulate ecologically in food webs.

The University of Georgia

UNIVERSITY OF GEORGIA
WARNELL SCHOOL OF FOREST RESOURCES
OUTREACH PUBLICATION SFR04-8*

Human Touch

People are exposed to calcium hypochlorite and associated materials in everyday products like household bleach, in the water of many swimming pools, and in municipal drinking water. Bleaching of textile and paper are other places where people can be exposed to calcium hypochlorite and its ions in solutions.

Irritation

Humans are impacted by small amounts of calcium hypochlorite and associated materiels presenting symptoms of irritated skin and mucus membranes. Eyes and open skin can be irritated at low doses, and inflamed and blistered with more exposure. This material is corrosive to living surfaces. The chlorine gas generated as calcium hypochlorite decomposes can irritate nasal passages and cause sore throats and coughing with small exposures, and serious breathing constrictions with greater exposures. Children tend to be more vulnerable to the corrosive nature of this chemical. Children are especially at risk from chlorine gas injury.

Gassed

Chlorine gas released from calcium hypochlorite causes eye and nasal irritation, sore throat, and coughing at low concentration exposures. Inhalation of greater amounts of chlorine gas leads to respiratory distress through airway constriction and accumulation of liquid in lungs. Exposure can lead to rapid breathing and wheezing. Breathing reactions usually occur 5 minutes to 15 hours after exposure.

The Cure

There is no specific antidote for calcium hypochlorite exposures other than removal from the exposure area, and water rinsing and cleansing of body and clothes. Flush hair and skin with large amounts of warm water. Irrigate eyes with saline or other appropriate material for an extended time. Seek immediate medical assistance. Chlorine exposure can lead to “reactive airway dysfunction syndrome” (RADS), an chemical irritant type of asthma.

Tests

Because chlorine, oxygen and calcium are essential elements for living things, general medical tests of blood and urine for these materials are not useful. Tests can be used to show the extent of damage. People exposed to large concentrations of calcium hypochlorite dust can be corrosive to other people and can release chlorine gas impacting anyone rendering aid. People exposed to only the chlorine gas released from calcium hypochlorite pose little risk to aid providers.

Conclusions

Calcium hypochlorite is a compound requiring great caution in handling and extreme care in storage. Landscapes and the people who use them can be impacted by calcium hypochlorite and the chlorine gas it can generate. Always read chemical labels carefully before using any product for proper use and storage, and for health and safety information.