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Quip Laboratories
(800) 424-2436
www.QuipLabs.com

ClO₂ Solutions From MB-10™ Tablets Can Kill Viruses in Less Than 2 Minutes

What Are MB-10 Tablets?

MB-10 Disinfectant Tablets are the most convenient way yet to deliver the benefits of chlorine dioxide to your facility hygiene or biosafety program, and are the only solid disinfectant on EPA's List N (EPA #: 70060-19-46269) with an Emerging Viral Pathogen claim (under the ingredient Aseptrol). They are also featured on the Center for Biocide Chemistries' list of Novel Coronavirus (COVID-19)–Fighting Products.

Background:

MB-10 tablets were first developed nearly 20 years ago as the first practical method of producing small amounts of a solution of substantially pure chlorine dioxide (ClO₂) in water outside of the laboratory. Tablets consist of a mixture of simple inorganic salts (such as magnesium sulfate, aka. Epsom Salts), sodium bisulfate (as an activator), sodium chlorite (the source of the ClO₂), and a small amount of chlorine generator (which is consumed in making ClO₂).

The powdered ingredients are dried to remove substantially all water, pressed into a tablet, and sealed into a water proof pouch for storage. When removed from the pouch and placed into water, the sodium bisulfate, sodium chlorite, and chlorine source react to make ClO₂ within the pores of the undissolved tablet, and that ClO₂ diffuses out into the bulk of the water to make a ClO₂ solution.

Once those reactions are done, the inert simple salts dissolve into the water to produce a very dilute solution of sodium, magnesium, sulfate, and chloride.



Discussion:

When MB-10 tablets were first commercialized, little was known about either the biocidal efficacy of pure ClO_2 solution or the rate of ClO_2 volatility from thin films of such solution.

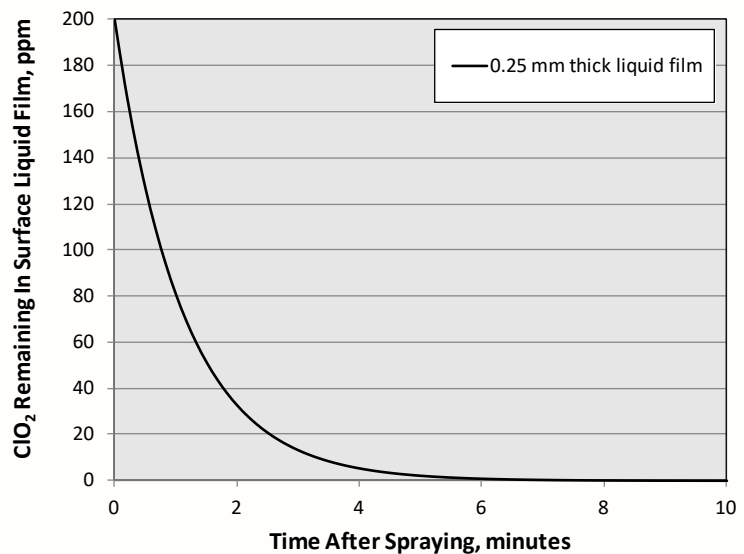
As a result, much of the efficacy testing was done using spray application with a 10 minute contact time since that was the standard for high performing products used in laboratory settings.

However, subsequent research combined with mathematical modeling found that all the ClO_2 was vaporized from thin liquid films in much less than 10 minutes, and, consequently, kill must be happening well before that time.

The graph to the right shows this effect. It is a graph showing the ClO_2 concentration left in a thin surface film as a function of time after spraying or wiping of the surface. It shows that initially (at time 0) the concentration is the starting concentration of 200 ppm. However, by 2 minutes 85% of that ClO_2 is vaporized, and by 6 minutes none is left.

To test how quickly MB-10 tablet solution would kill viruses, another set of experiments were run to test the efficacy at different contact times against a virus of the type that is most difficult to kill (a

Almost All ClO_2 Is Lost From Thin Surface Films In a Less Than 4 Minutes





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small nonenveloped virus called MS2 Bacteriophage). Other virus types, such as large enveloped coronaviruses, would be expected to be killed in a shorter time than MS2 Bacteriophage.

The table to the right shows the results of that study. Each test surface was loaded with about 10^8 (100 million) dried virus particles. They were then sprayed with a solution containing 200 ppm of ClO_2 made from MB-10 tablets.

Samples were removed from the test and neutralized (to stop the killing of virus) after 30 seconds, 90 seconds, 3 minutes, and 5 minutes.

**200 ppm MB-10 tablet solution
was effective in 90 seconds or less**

Contact time	Efficacy (% kill)
0 seconds	0
30 seconds	99.33%
90 seconds	>99.9999%
3 minutes	>99.9999%
5 minutes	>99.9999%

Conclusions:

The results showed that by 30 seconds over 99.3% of the viruses had been inactivated, and by 90 seconds substantially none of the virus was capable of infection.

- 1) Thin surface films of ClO_2 lose all their ClO_2 in well under 10 minutes, leaving only a dilute solution of simple inorganic salts in tap water.
- 2) Even the hardest to kill noneveloped viruses are killed rapidly by ClO_2