

Synergistic Behavior with Hydrogen Peroxide?

Peracetic acid solutions also contain hydrogen peroxide. PeroxyChem's VigorOx® WWT II PAA solution contains 15% PAA by weight, but also 23% hydrogen peroxide. It is believed that the predominant disinfection comes from the peracetic acid, as PAA is a much more potent antimicrobial agent than hydrogen peroxide, especially at low concentrations. Several research studies have shown that there are virtually no synergistic effects between the PAA and hydrogen peroxide⁸. However, several investigations suggest that there may be enhanced microbial efficiency due to a potential efficacious synergy in PAA and hydrogen peroxide^{7,8,9}. These investigations compared solutions containing "pure" PAA, hydrogen peroxide only and commercially available combinations of both PAA and hydrogen peroxide. The results suggest that the kinetic model of combined PAA and hydrogen microbial inactivation occurs in a staged process, including sensitization, catalase attack and irreversible attack leading to lysis. These works indicate that PAA must first initiate the attack on the cell, damaging the protective systems before the hydrogen peroxide can participate in actively in the bacterial inactivation reaction, and that once the catalase within the microorganism is inhibited by PAA, the hydroxyl radical can rapidly damage the cell.

Conclusions

A definitive understanding of the PAA microbial inactivation processes is not yet at hand. However, there are many postulated pathways for PAA to damage and inactivate microbes, and it is clear that these multiple avenues of attack make PAA a very effective antimicrobial under wastewater conditions. Today, there is ongoing work using a variety of DNA and RNA analyses techniques that will continue to elucidate the nature and mechanism of PAA inactivation of bacteria and viruses. The *Disinfection Forum* will be reporting on these efforts throughout the year.

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