

Efficacy of Chlorine Dioxide Against Biofilm-Phenotype Bacteria Using a Hydroxyapatite-coated Tooth Model

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Chlorine dioxide has proven to be efficacious against bacteria, viruses, and fungi in many industries including water purification and wound care. OraCare is a chlorine dioxide containing oral rinse designed to kill microbes that cause gum disease and the accumulation of plaque. This study evaluated the efficacy of Chlorine dioxide against biofilm phenotype bacteria via standard zone of inhibition (ZOI) methods and a hydroxyapatite-coated tooth model. Chlorine dioxide had an average ZOI of 7.48 mm against 4 Gram positive bacterial samples, which was smaller than the averages for the other tested solutions: Crest Pro-Health (10.17 mm), Listerine Antiseptic (9.28 mm) and Peridex Oral Rinse (9.12 mm). It had an average ZOI of 7.67 mm against 4 Gram positive bacterial samples, which was smaller than the averages for the other tested solutions: Crest Pro-Health (8.16 mm), Listerine Antiseptic (8.43 mm) and Peridex Oral Rinse (8.44 mm). Chlorine dioxide demonstrated comparable, but not superior, activity in the ZOI test. Four assays accompanied the hydroxyapatite-coated tooth model. In a colony forming unit (CFU) assay, Chlorine dioxide demonstrated similar anti-biofilm activity to the other tested solutions. However, Chlorine dioxide did demonstrate higher activity against *C. albicans* (5500 CFUs) than Listerine (11000 CFUs) and slightly higher activity against *P. aeruginosa* (1010000 CFUs) than PerioShield (1330000 CFUs) and Peridex (130000 CFU's). In an Optical Density assay, Chlorine dioxide demonstrated similar, but again not superior, activity to Listerine, PerioShield, and Peridex. However, Chlorine dioxide did demonstrate higher activity against *C. albicans* (absorbance 0.496 nm) than Listerine (0.569 nm) and PerioShield (0.529 nm). SEM images of tooth surfaces further confirmed the overreaching observation that Chlorine dioxide demonstrated comparable activity to the other solutions. However, since *C. albicans* is prominent amongst oral flora and presents itself when bacterial plaque is in transition from the planktonic phenotype to the biofilm phenotype, it is one to emphasize in testing an oral rinse. In this sense, Chlorine dioxide is promising. Further studies could examine whether Chlorine dioxide may be efficacious against bacteria which grow on denture materials or other oral appliances.

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