

The Benefits of Preoperational Oral Rinsing during and after the Novel Coronavirus Pandemic

A survey of mouth rinses and their relative potential to reduce viral loads in the oral cavity

Camesia O. Matthews, DDS

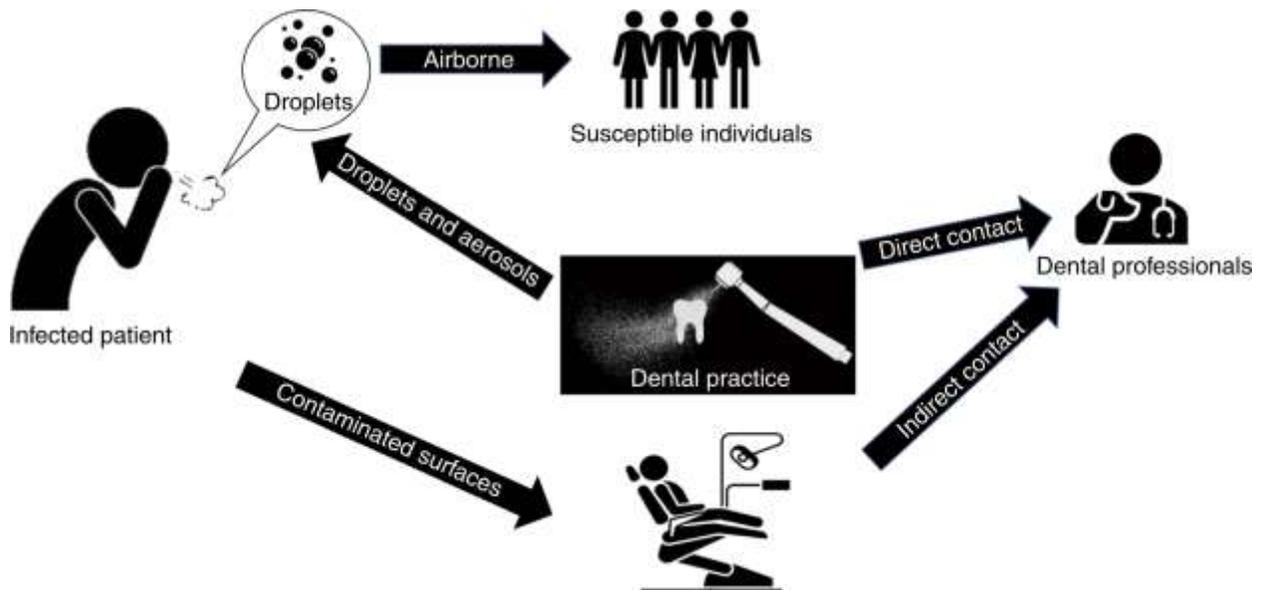
Abstract

The benefits of pre-rinsing prior to dental procedures have been promoted by clinical and industry studies. (Molinari ,1992), (“Pre-Rinsing A Must for the Dental Professional,” 2018) However, the practice has still not been widely adopted by most oral health and medical providers. In light of the novel coronavirus (2019-nCoV) pandemic, dental professionals must consider regular pre-rinsing as a potentially effective method of significantly reducing the viral load in the oral cavity. In this brief, we report on the efficacy of antimicrobial mouth rinses that may be particularly effective against viruses.

Overview

Protecting dental professionals from COVID-19

Even with strict social distancing measures, the Centers for Disease Control and Prevention is predicting that as many as 10 million Americans will be infected by COVID-19, the disease caused by the 2019-nCoV virus; notably, the CDC also claims that as many as 25% of those infected by 2019-nCoV may also be asymptomatic. (Fink , 2020) Needless to say, dental professionals performing emergency procedures now, and routine procedures even beyond the peak of the pandemic, need to be on guard. A recent paper (Peng, 2020) describes the many ways that dental professionals may be exposed to the novel coronavirus (Image Courtesy of the *International Journal of Oral Science*).



The problem isn't limited to the novel coronavirus. Indeed, any microbe residing in the oral cavity including bacteria, fungi, or other viruses, can escape during most aerosol-generating dental procedures, putting the operating dental professional, their assistants, and other patients and staff at risk of infection. Also, harmful flora have been shown to negatively impact the effectiveness of some dental procedures, such as filling cavities-- especially if a dental rubber dam is not used. (Peng, 2020)

Mouth rinse agents have long been used in oral health, but primarily for post-procedural rinsing--a final step to remove particles, microbes, and toxins from the oral cavity, or when a patient has been diagnosed with periodontal disease. Indeed, studies show that many patients who brush regularly focus on the teeth, which accounts for 22% of the mouth, and miss the 78% that is soft tissue, where the pathogens often reside. ("5 Reasons why OraCare is a Game Changer," 2018) Given the demonstrated effectiveness of mouth rinses at targeting microbes, a strong case can be made for reducing the microbial load in the oral cavity with preoperational rinsing, particularly during the novel coronavirus pandemic.

Preoperational rinsing is especially important for the following reasons:

1. **To reduce viral transmission via airborne spread:** Most dental procedures generate aerosols and droplets, which become effective vehicles for spreading the disease. The NIH recently released statistics showing that the virus can live up to three hours suspended in a fine mist (Hendrick, 2020).
2. **To reduce surface contamination:** The NIH recently released statistics showing that the novel coronavirus can survive up to three days on plastic and stainless steel surfaces, and up to four hours on copper surfaces. (Hendrick, 2020) Pre-rinsing--arguably even when patients first enter the practice--could reduce contamination from infected patients who cough, breathe, or otherwise transmit oral fluids to the operatories and other surfaces in the treatment areas

To reduce transmission from the oral cavity to other internal systems: Because COVID-19 has had a particularly deleterious effect on the respiratory system, ventilation and intubation has been required for critically ill patients. Therefore, even in non-dental settings, pre-rinsing reduces the microbial load of patients who may be infected with COVID-19 and/or periodontitis and other dental bacterial

infections; and minimizes the risk of transference of microbes from the oral cavity to the internal systems during intubation.

Comparing Antimicrobial, Antibacterial, and Antiseptic mouth rinses

Many rinses available to clinicians and consumers have been formulated with antimicrobial properties and designed to penetrate the plaque matrix where pathogens reside. Most mouth rinses are typically classified as either antimicrobial, antibacterial, or antiseptic. (In fact, the latter two are technically types of antimicrobial agents.) The CDC defines antimicrobials as products designed to kill or inactivate a variety of microbes, including fungi, bacteria, parasites, and viruses. (Freeman, 2020) Antibacterial agents, also known as antibiotics, are more targeted: they kill, inhibit, or inactivate bacteria, specifically. (Freeman, 2020) Antiseptic agents are like antimicrobials by definition in that they target a broad spectrum of microbes, including bacteria, fungi, protozoa, and viruses, but they work specifically by inhibiting their growth, reproduction, or metabolism. (Goldstep, 2014)

While antibacterial products only target bacteria, antiseptic and antimicrobial agents can work against various types of microbes. So if a choice must be made between antiseptic, antimicrobial, or antibacterial mouthwash, the decision must rest on whether the outcome requires specificity (*is bacteria specifically being targeted?*) or whether a broad spectrum, or unknown class, of microorganisms is being targeted. For usage as oral rinses, antimicrobial and antiseptic products must be bioavailable, stable (especially in the presence of saliva), nontoxic to oral tissue, effective against targeting pathogens, and able to prevent bacterial resistance. (Goldstep 2014)

Benefits of oxidative antimicrobial mouth rinses

In this report, we examine three “oxidative” antimicrobial/antiseptic rinses that may be effective antiviral rinses. Oxidative agents employ the chemical process of oxidation to alter the chemical structure of a pathogen’s proteins, lipids, or nucleic acids. Oxidation can inhibit the action of proteins produced by viruses.

Hydrogen Peroxide

Known colloquially as peroxide, or by its chemical formula, H_2O_2 , hydrogen peroxide is widely used as a bleaching agent, antiseptic, and oxidizer. It is the latter function that makes it particularly promising as an antiviral mouthwash. Peroxide is toxic to cells because it can oxidize proteins, membrane lipids, and DNA, and it has been proven as an effective mouthwash (Boyd, 1989)(Hasturk, 2014) For oral use, the 2-3% peroxide solution that is typically sold over the counter should be diluted to 1%-1.5% and the patient should gargle and rinse with the solution for 60 seconds. As of March 2020, peroxides are the only class of mouthwash that has been recommended by the CDC and the American Dental Association for use against 2019-nCoV--specifically Colgate Peroxyl and Listerine Whitening Mouthrinse (Hendrick, 2020).

Povidone-Iodine

Povidone-iodine (also known as iodopovidone), the active ingredient in the Betadine mouthwash, is an antimicrobial chemical that is widely used as an antiseptic and topical disinfectant. According to Betadine’s website, this chemical complex is made up of povidone, hydrogen iodine, and elemental iodine. It exhibits a broad range of microbicidal activity against bacteria, fungi, protozoa, and viruses. Povidone-iodine works by iodination and oxidation of cytoplasmic and membrane compounds. (Eggers 2018).

In a study of its efficacy against a range of oral and respiratory-tract pathogens, povidone-iodine-based mouthwash rapidly inactivated SARS-CoV, MERS-CoV, influenza virus A

(H1N1), and rotavirus after 15 seconds of exposure (Eggers, 2018) . For the purpose of reducing the salivary load of oral microbes, including saliva containing 2019-nCoV, a 0.2% concentration of the chemical complex is recommended. (Peng 2020) But despite its effectiveness as an antiviral, povidone-iodine is not recommended for everyone. It should not be used by patients who are allergic to iodine, who are pregnant, who have thyroid issues, or are taking lithium. (“Povidone Iodine Drug Summary” 2020)

OraCare

The third antimicrobial mouthwash that has been demonstrated as an effective oral pre rinse is chlorine dioxide. (Downs, 2015) This chemical compound is the active ingredient in the OraCare mouthwash. Chlorine dioxide is an aggressive oxidizer and bleaching agent. In the body, or in the oral cavity, chlorine dioxide inhibits the production of proteins that bacteria and viruses need to grow. (Pham, 2018) Their formation is prevented by the oxidation electrical potential that chlorine dioxide exerts on its immediate environment. (“Pre-Rinsing: A Must for the Dental Professional,” 2018)

According to the oracare products website, because chlorine dioxide is a gas at room temperature, the OraCare mouthwash uses a two-bottle system. Just prior to use, the two solutions are mixed in equal parts; the product is allowed to be activated for 30 seconds; and then the patient must rinse immediately after with the mixture for 30-60 seconds.

Chlorhexidine and Listerine

Although widely used in dentistry, chlorhexidine and Listerine mouth rinse have not been proven as effective against viruses as oxidative agents. (“Listerine Usage Guidelines and COVID-19 Outbreak,” 2020) Chlorohexidine binds via adsorption to surfaces in the mouth. It is highly effective against bacteria. The chlorhexidine molecule, which is positively charged, binds strongly to the negatively charged bacterial cell surface, altering the integrity of the cell wall, leading to rupture, leakage, and eventually bacterial cell death. (Goldstep, 2014)

As a topical agent, chlorhexidine is an effective antiviral (Nan, 2016), even reportedly against 2019-nCoV (Zhou, 2020), but less is known of its efficacy as a pre-rinse antiviral. Listerine as an antiseptic lyses, kills, and inhibits growth of both gram-positive and gram-negative bacteria. According to the Listerine company's website, its anti-microbial action destroys the bacterial cell surface. It also inhibits the growth of biofilm, like dental plaque, and slows the regrowth of bacteria on Listerine-treated surfaces. One option that has been recommended for dental providers is to use either chlorhexidine or Listerine in conjunction with peroxide as pre-rinses. (Hendrick, 2020)

Conclusion and Recommendations

As the medical and scientific research community learns more about 2019-nCoV and COVID-19, dental professionals and mouth rinse manufacturers may devise more effective pre-rinses to combat the pathogen--whether or not they work by oxidative action.

Based on what we know presently, dentists, hygienists, and their assistants should have their patients pre-rinse with oxidizers ,including, but not limited to: hydrogen peroxide, or hydrogen-peroxide-containing mouth rinses (1-1.5%), povidone-iodine (betadine), 0.2% concentration recommended, or chlorine dioxide (OraCare brand)--as long as the patient is not contraindicated to one of these oxidative mouth rinses. These oxidative antimicrobial rinses are promising candidates to reduce the viral load in oral cavities while working against bacteria, fungi, and other microorganisms.

Disclaimer: These mouth rinses, to our knowledge are not being recommended by this report or the NDA as cures for COVID-19. Information gathered here is subject to change as more research is done on COVID-19.

This report is sponsored by the National Dental Association, which promotes oral health equity among people of color. Specifically, our mission involves informing health policy and improving the delivery of oral health care in underserved communities. For more information about our response to the novel coronavirus, visit: <https://ndaonline.org/nda-coronavirus-psa/>

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