Coronavirus Disease 2019 and Mouthwashes – A Review Article
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Abstract
The coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) belongs to the coronavirus family. It is linked to transmission from person to person. Coronavirus disease 2019 (COVID-19) was recently discovered in contaminated patients’ saliva. Because of the close closeness to the patient during dental care, the significant production of aerosols, and the discovery of SARS-CoV-2 in saliva, the oral cavity has been identified as a potential reservoir for COVID-19 transmission. Mouthwashes are popular because they help to reduce the amount of bacteria in the mouth. Despite the lack of clinical evidence, to minimize the amount of microorganisms in aerosols and drops during oral procedures, antimicrobial mouth rinses with chlorhexidine, cetylpyridinium chloride, povidone-iodine, Listerine, and hydrogen peroxide have been prescribed before surgery. As a result, the aim of this paper is to analyze the benefits and drawbacks of most antiseptic mouthwashes used in dentistry, as well as to provide a detailed review of current guidelines for the use of mouthwashes in the battle against the COVID-19 pandemic.

Keywords: Coronavirus disease 2019, Mouthwashes, Oral health

Introduction
Before routine dental treatment, especially before surgery, antiseptic mouthwashes have long been a standard precaution. They play a critical role in minimizing the number of microorganisms in the mouth.

According to new research, rinsing the mouth will aid in monitoring and minimizing the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission.

The goal of this paper is to give a full evaluation of current mouthwash recommendations in the coronavirus disease 2019 (COVID-19) pandemic, as well as a look at the benefits and drawbacks of most common antiseptic mouthwashes used in dentistry because specific evidence on the safety and efficacy of antiseptic mouthwashes in COVID-19-positive patients is lacking and ambiguous.

Mouthwashes used Against Viral Infections
Mouthwashes are regularly used solutions for cleaning the mouth, particularly before oral surgery because of their potential to lower the amount of germs in the oral cavity and colony-forming units in dental aerosols. While there is no scientific evidence that mouthwashes can prevent SARS-CoV-2 transmission, the American Dental Association (ADA) and the Centers for Disease Control and Prevention recommend using them before oral procedures.

Chlorhexidine (CHX)
CHX causes bacterial cell wall lysis in Gram-positive and Gram-negative bacteria, aerobes, facultative anaerobes, and fungus so it is a broad-spectrum antiseptic that increases bacterial cell wall permeability.

It is used in dentistry to treat periodontal disease and suppress dental plaque. Since SARS-CoV-2 is an enveloped virus, researchers have been investigating how to integrate CHX into a mouthwash for COVID-19 patients. From day 1 to day 9 of their hospital stay, researchers at Korea University College of Medicine looked at the viral loads of SARS-CoV2 in two patients with COVID-19. On days 3–6, the patients rinsed their mouths for 30 s with 15 mL of 0.12% CHX gluconate mouthwash. The viral loads in the saliva were tested using real-time reverse transcription polymerase chain reaction, and the researchers discovered that the viral load was substantially decreased for 2 h after using the mouthwash, but then increased again.
While these findings are encouraging, it should be noted that the sample size in this study is very limited, and therefore, the results cannot completely represent the effectiveness of CHX as a mouth rinse.[8]

Furthermore, an in vitro study using a 0.02% CHX rinse for 10 min to test the effectiveness of oral rinses against the viral lipid envelope of SARS-CoV-2 found that it “only weakly inactivated coronavirus strains.” CHX, on the other hand, may be more powerful in vivo, where it may bind to oral surfaces and be released overtime, according to the same report.[9]

Still other research suggests that CHX shows a “non-effective effect.”[9] Alternatively, rinsing with 0.12% CHX solution for 30 s has been shown to minimize viral load for 2 h, but the viral load rises again after that.[7]

Hydrogen Peroxide (H₂O₂)

H₂O₂ is an oxidizing agent that produces oxygen-free radicals, which can kill lipid membranes.[10] Furthermore, since H₂O₂ is a low-cost commodity, it has a lot of potential if it can be manipulated to contribute to destroying SARS-CoV-2 in the mouth. As a result, the new temporary ADA recommendations provide 1.5% H₂O₂ during dental treatments to minimize the risk of COVID-19 transmission.[11]

According to an in vitro analysis, a standard “3% solution (ofH₂O₂) should be diluted up to a concentration of 1%” before being used in the mouth.[12] Higher concentrations of H₂O₂ can easily destroy intraoral tissue and cause gastric and colon disturbances, so this dilution is critical. These mouthwashes must have the right concentrations to be successful while not being too heavy to cause damage.[13]

However, a recent analysis of the effectiveness of H₂O₂ as a mouth rinse found that at a concentration of 1%, H₂O₂ had no effect on SARS-CoV-2 viral load in intraoral positive subjects, and that rinsing creates a “false sense of security” in providers, so it should be cautioned against.[14] H₂O₂ has been used as a disinfectant for a long time, but at much higher concentrations than are safe for use in the mouth.[15]

To add H₂O₂ into a mouthwash, it will be necessary to find a concentration that is both safe and efficient. SARS-CoV-2 virus remains on mucous membranes for 2 days before spreading to the lower respiratory tract, according to recent reports.[16] As a result, it has been suggested that rinsing with a form of H₂O₂ during this time delay can prevent the virus from spreading to the lower respiratory tract, where it’s most harmful. Although H₂O₂ has not been tested specifically for use as a mouthwash, experiments using 0.5% H₂O₂ have shown that it can inactivate SARS on inanimate surfaces in just 1 min.[17]

Another in vitro analysis of H₂O₂ found that the necessary low “clinically recommended concentrations of 3–1.5% had minimal virucidal activity after 15 s,” according to another study.[14] H₂O₂ has a lower effectiveness in reducing the viral load of SARS-CoV-2 as compared to other mouth rinses tested.

Cetylpyridinium Chloride (CPC)

Humans may use CPC, which is a non-toxic quaternary ammonium compound.[18] CPC 0.05% has been used as an alternative to reduce dental plaque and gingivitis, in patients who experience mucosal inflammation and stains as a result of CHX. In influenza patients, CPC has been shown to have an antiviral effect, reducing the duration, and severity of cough and sore throat.[19]

The ability to destroy viral capsids and the lysosomotropic mechanism of action have led to speculation about a possible action against SARS-CoV-2.[20] CPC may be useful against other enveloped viruses, such as coronavirus, based on these findings.

Povidone-Iodine (PVP-I)

PVP-I is a water-soluble iodine compound that has been used as a skin antiseptic and mouthwash for a long time.[21] Mucositis, oropharyngeal infection prophylaxis, and ventilator-associated pneumonia prevention are all treated with it at a 1% concentration.

Iodine penetrates bacteria rapidly after dissociating from PVP-I, destroying proteins and oxidizing nucleic acid structures, resulting in microbial death. PVP-I has been discovered to have stronger virucidal activity than other regularly used antiseptics such as CHX and benzalkonium chloride in prior research.[22]

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It is safe with incidence of 0.4% allergy cases, does not cause tooth or tongue discoloration or taste disturbances, and can be used with electrocautery, unlike alcohol-based products.[23] Many in vitro studies have demonstrated its efficacy against a variety of viruses, including SARS-CoV, Middle East respiratory syndrome coronavirus (MERS-CoV), and influenza virus A.[24]

According to a recent study using 0.23% PVP-I mouthwash for at least 15 s, before procedures will reduce salivary viral load, implying that it can be used in COVID-19-positive patients.[25]

PVP-I has shown great promise against SARS-CoV-2, but it has some drawbacks, such as being contraindicated in people with hyperthyroidism, renal insufficiency, anaphylactic allergy, pregnant women, and people taking lithium-based antidepressants or receiving radioactive iodine therapy.[12-14]

Listerine

Phenolic chemicals (like LISTERINE®) have been thought to be germicidal and useful in decreasing plaque and gingivitis for over a century. Several studies have recently established the combined efficacy of essential oil (EO) mouth rinse – LISTERINE® in achieving healthy gingival tissue and plaque clearance (Claffey, 1985).[26]

Several studies have recently demonstrated the combined efficacy of essential oil (EO) mouthrinse-LISTERINE® in
achieving safe gingival tissue and plaque reduction (Claffey, 1985). The effect of an EO-containing oral antiseptic (LISTERINE®) on the reduction of viral titer in saliva during active viral infection was investigated in a clinical trial. As a result, LISTERINE® decreased viral infection in oral fluids for at least 30 min after the oral rinse (Meiller et al., 2005).[27]

**Johnson’s Baby Shampoo**

A 1% dilution of Johnson’s Baby Shampoo, for example, has been shown to be both safe and efficient in the treatment of rhinosinusitis.[17] When screened against HCoV-229e, which was used as a proxy for SARS-CoV-2 due to their related pathogenicity, the 1% Johnson’s Baby Shampoo inactivated the virus more than 99.9% with a contact time of 2 min.[17]

**Chlorine Dioxide**

Mouthwashes containing chlorine dioxide, such as OraCare, may be able to substantially minimize the virucidal load of SARS-CoV-2, as it has been shown to be effective against similar viruses. Chlorine dioxide oxidizes viral capsids by interacting with cysteine, tyrosine, and tryptophan amino acid residues on the surface of the virus. Since the virus’s spike protein contains large amounts of these main amino acid residues, it is a promising agent against SARS-CoV-2.[28]

In addition, when chlorine dioxide was examined against related SARS viruses in wastewater, it was found to inactivate “94.4% of the virus after 1 min of exposure.[29]”

**Conclusion**

Given the restrictions of this brief study and the lack of clinical evidence, we recommend that dentists should use mouthwashes preoperatively to minimize SARS-CoV-2 viral load from previous dental procedures and the risk of cross-infection while treating patients during the pandemic. Antiseptic mouthwashes must be evaluated in clinical trials with control subjects and on a broad scale to determine their effectiveness against SARS-CoV-2. More research on SARS-CoV-2 would be needed to validate Johnson’s Baby Shampoo, CPC, and chlorine dioxide as virucidal competitors, but the concept of not restricting research remains. There is an immediate need for research in this area.

**References**

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