

Which Mouthwashes is Appropriate for Eliminating Coronaviruses? A Mini Literature Review

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Introduction: Coronaviruses can lead to severe respiratory disease and have a significant fatality rate. Dental professionals are high-risk groups because of too many exposures to patients in dental practice. Various mouthwashes have been used for different goals in dentistry. The aim of this study is to assess the appropriate mouthwash to eliminate coronaviruses for pre-procedural rinsing in dental practice. **Materials and Methods:** Electronic databases: PubMed, Scopus, and MEDLINE searched systematically. 5 different keyword combinations used based on MeSH (Medical Subject Headings) database. The search language and time period were English and 1990 to 2020, respectively. **Results:** Finally, 4 studies included in this review. According to the studies substances that were tested against coronaviruses as a mouthwash were Povidone-iodine (PVP-I) and Chlorhexidine (CHX). 3 studies indicated that PVP-I is a promising substance to eliminate coronaviruses such as SARS-CoV, MERS-CoV and also, influenza virus A (H1N1) and rotavirus. Virucidal effect of CHX against coronaviruses was insufficient. **Conclusion:** PVP-I gargle/mouthwash is the only approved mouthwash for pre-procedural rinsing in dental practice to eliminate coronaviruses according to the available literature.

Keywords: Coronavirus; Mouthwashes; Pre-procedural; Rinsing

Introduction

Coronaviruses are positive-stranded RNA and enveloped viruses and their nucleocapsid are transferred into the host cell, they depend on the fusion of the envelope with the host cell membrane (1). 7 main coronaviruses (CoVs) have been recognized until 2020 including 2019-nCoV among these 7 viruses 3 of them (SARS-CoV, MERS-CoV, 2019-nCoV) can lead to severe respiratory syndromes and have a significant mortality rate (2-4). At the beginning of the 21st century, two pathogenic viruses, severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) appeared in humans that were genetically originated from bats, palm civets, and dromedary camels (5, 6). SARS-CoV emerged in 2002 that spread to five continents with a 10% mortality rate and in 2012 MERS-CoV emerged in the Arabian Peninsula with a 35% mortality rate (6). A novel coronavirus (2019-nCoV) causing severe acute respiratory disease like pneumonia emerged recently in Wuhan, China with approximately 2.3%

fatality rate and the most highlighted way of transmission of all mentioned viruses is person-to-person (7-9). The human-to-human route of transmission indicates that patients and dentists in dental procedures are at risk of coronavirus infection due to the face-to-face communication and the exposure to blood, saliva, and other body fluids (4). Mouthwashes can reduce the accumulation of oral plaque as a major risk for oral diseases such as periodontal diseases and dental caries (10). Mouthwashes in dentistry are used in different aspects for example they are used for reducing dental caries, reducing halitosis, and treating dry mouth (11). They also are used for pre-procedural rinsing (12). Some mouthwashes show rapid bactericidal and virucidal activity (13). Chlorhexidine (CHX), Essential oils, Cetyl pyridinium chloride, Triclosan, Povidone-iodine, and Hydrogen peroxide are the most common mouthwashes used in dental practice (10, 14). This review aimed to assess the appropriate mouthwash to eliminate coronaviruses for pre-procedural rinsing in dental practice.

Table 1. Data of the studies

Authors	Publication Year	Study Design	Mouthwashes	Procedure	Main Results
Wood A. <i>et al.</i> (17)	1998	Experimental (<i>In-vitro</i>)	CHX	Virucidal effect of chloroxylenol, benzalkonium chloride, and chlorhexidine were evaluated against a range of enveloped and non-enveloped human viruses	The poor activity of CHX against enveloped and non-enveloped viruses
Eggers M. <i>et al.</i> (16)	2015	Experimental (<i>In-vitro</i>)	PVP-I	Three PVP-I antiseptic products were tested: 4% PVP-I skin cleanser, 7.5% PVP I surgical scrub and 1% PVP-I gargle/mouthwash	PVP-I-based hand wash and PVP-I gargle/mouthwash reduced viral load and provided protection against and MERS-CoV, and MVA
Eggers M. <i>et al.</i> (13)	2018	Experimental (<i>In-vitro</i>)	PVP-I	PVP-I was tested against <i>Klebsiella pneumonia</i> and <i>Streptococcus pneumonia</i> and SARS-CoV and MERS-CoV, rotavirus strain Wa and influenza virus A (H1N1 subtype)	PVP-I mouthwash (concentration of 0.23% PVP-I) showed effective bactericidal activity against <i>Klebsiella pneumonia</i> and <i>Streptococcus pneumonia</i> and virucidal activity against SARS-CoV, MERS-CoV, influenza virus A (H1N1) and rotavirus after exposure
Eggers M. (15)	2019	Review	PVP-I	----	PVP-I showed antiviral, antibacterial and antifungal effects PVP-I mouthwashes significantly reduced viral load in the oropharynx The virucidal activity of PVP-I mouthwashes has been observed against SARS-CoV, MERS-CoV, influenza virus A (H1N1) and rotavirus

PVP-I: Povidone-iodine; MVA: modified vaccinia virus Ankara; MERS-CoV: Middle East respiratory syndrome coronavirus; SARS-CoV: severe acute respiratory syndrome coronavirus; CHX: Chlorhexidine

Materials and Methods

Studies in this review were assessed by systematic searching in the online databases PubMed, Scopus, and MEDLINE. All keywords were checked with the MeSH (Medical Subject Headings) database. The search phrases were: [mouthwashes AND coronavirus], [mouthrinse AND coronavirus], [mouth rinse AND coronavirus], [preprocedural AND rinse], and

[preprocedural AND mouthwashes]. Searches were limited to published and peer-reviewed articles in the English language from 1990 to 2020. Inclusion criteria in this review were: 1) Include one of the mentioned keyword combinations 2) Relevant to our study question. Eventually, for the studies data regarding the Authors, publication year, study design, mouthwashes, procedure, and the main results were extracted.



Results

Finally, 4 articles met our inclusion criteria and were included in the review. The main data of each study including each substance concentration and duration of application is illustrated in the table (Table 1). The first study was carried out in 1998 and the last study was conducted in 2019. Among these 4 studies, 3 was experimental (In-vitro), 1 was review. Substances that were tested against coronaviruses and few other microorganisms, was Povidone-iodine (PVP-I) and Chlorhexidine (CHX). 3 studies (75% of the papers) demonstrated that PVP-I is a promising substance to eliminate coronaviruses such as SARS-CoV, MERS-CoV and also, influenza virus A (H1N1) and rotavirus. Only one study was evaluated the virucidal effect of CHX and showed a non-effective effect.

Discussion

In this study, we searched common medical literature databases and reviewed 4 articles that matched the study inclusion criteria and evaluated the virucidal effect of PVP-I and CHX on coronaviruses. Virucidal effects of mouthwashes are poorly investigated in the literature compared to bacterial effects may be due to difficulties regarding viral culture in comparison to bacterial colony formation units surveys. These studies showed that PVP-I is a promising substance that eliminates coronaviruses efficiently (13, 15-17). Povidone-iodine (PVP-I) is an antiseptic that is commonly used in clinical settings, including for skin disinfection before and after surgical operations and avoids spreading of opportunistic pathogens. Also, PVP-I is more efficient than chlorhexidine in handwashing (15). The European Wound Management Association showed a broad spectrum of PVP-I activity against bacteria, viruses, fungi, and endospores (18). Significant resistance or cross-resistance has not been observed for iodine like PVP-I (19). It is useful for wound healing (20). PVP-I contains I₂ and hypiodous acid (HOI) and the iodine molecules oxidize vital structures such as amino acids, nucleic acids and membrane components of a pathogen (21). A 1% PVP-I gargle/mouthwash can reduce viral load (such as MERS-CoV) in the oral cavity and the oropharynx (22). Eggers M. *et al.* in their experimental studies used viral and bacterial cultures and did not evaluate

the effect of PVP-I on coronaviruses in humans or animals. Perhaps, further studies should be carried out to do this evaluation and assess the possible side effects of PVP-I in humans. The main limitation of our study was the insufficient number of articles in this subject. Randomized Clinical Trials (RCTs), case-control, cohort, and cross-sectional studies are needed to solve this limitation. Also, it is essential to perform more investigations on the virucidal effect of other mouthwashes on coronaviruses.

Conclusion

Based on the published studies Povidone-iodine (PVP-I) mouthwash is the only approved one to eliminate coronaviruses and will be recommended in dental practice for pre-procedural rinsing.

Conflict of Interest: 'None declared'.

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