SARS-CoV-2: a protocol for disinfection of toothbrushes

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NOTES

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To THE EDITOR – In response to the article by Meister et al, “Virucidal efficacy of different oral rinses against SARS-CoV-2” (1), this letter aims to contextualize how rinses and/or their active ingredients could reduce the cross-transmission capacity of SARS-CoV-2 by toothbrushes in familiar (individual use) and collective (school and hospital) environments, emphasizing the importance of toothbrush disinfection in the transmission of SARS-CoV-2 and suggesting a hygiene protocol.

MEISTER et al. found that several mouthwash formulations could reduce the viral load of SARS-CoV- 2 in saliva and its transmission. Toothbrushes play an essential role in oral hygiene, but they can also act as reservoirs for microorganisms, favoring the transmission of diseases in healthy and sick individuals [2]. Thus, disinfection of toothbrushes and hygiene of the oral cavity are important to control the transmission of SARS-CoV-2, especially in asymptomatic individuals or in those who await the test result for COVID-19, since high viral loads are found in saliva, nasopharynx and oropharynx [3].

However, which would be the most effective rinse compositions for controlling the transmission of SARS-CoV-2 has not yet been established [2]. MOOSAVI et al. [5] reported the need for clinical trials to test the effectiveness of mouthwashes in reducing viral load but highlighted that the use of mouthwashes can reduce the risk of virus transmission. As clinical trials require time, the results of in vitro studies may provide us with valuable information on the effectiveness of mouthwashes against SARS-CoV-2 [1, 6]. There is still no data on the use of substances for the disinfection of toothbrushes against SARS-CoV-2. Thus, based on the results reported by MEISTER et al. [1], the following questions can be asked to suggest a brush disinfection protocol: (1) Did the rinses ensure the elimination of virus on the

toothbrush? (2) Is the immersion of the toothbrush in rinses effective in reducing the viral load of SARs-CoV-2?

Table 1 compares the different types of substances present in mouthwashes tested against SARS-CoV-2. According to the in vitro results found, the antiseptic solution with the combination of ethanol and essential oils (Listerine Cool Mint®) seemed to be the first choice among the solutions tested for disinfecting toothbrush bristles to control colonization and transmission of the virus [1, 7]. The indication would be to immerse the brush in this antiseptic solution for 20 minutes after brushing, in an individual container, and brushes must be stored dry, both individually and collectively [2]. Moreover, MEISTER et al. [1] demonstrated that the time of mouthwash retention in the oral cavity, with the same substance, is 30 seconds to reduce viral load in the oral cavity. However, toothbrushes have retentive niches due to the presence of bristles and moisture; therefore, a longer exposure time should be recommended. FRAZELLE et al. [8] recommend a 20-minute immersion time for brush disinfection. SARS-CoV-2 can remain infectious on inanimate surfaces for up to nine days, and the disinfection of these surfaces with 0.1% sodium hypochlorite or ethanol between 62% and 71% significantly reduced its infectivity with one-minute exposure [9]. Thus, at a collective level, such as in schools and hospitals, the toothbrush handles could be disinfected with 70% alcohol for one minute [9], after the hand-washing procedures.

Based on these studies, we suggest a hygiene protocol for disinfecting toothbrushes to reduce viral loads and the transmission of the SARS-CoV-2 virus in a family or collective environment:

1. Hand washing with soap and water or rubbing with 70% alcohol gel;

2. Disinfection of the toothbrush handle surface with 70% alcohol for one minute (only in a collective environment);
3. Tooth brushing;
4. Washing and new disinfection of the toothbrush handle with 70% alcohol for one minute (only in a collective environment);
5. Immersion of the toothbrush in a solution of essential oils and ethanol (Listerine Cool Mint® or similar formulation) for 20 minutes;
6. Dry brush individual storage;
7. In cases positive for COVID-19, the toothbrush should be discarded.

As most studies of oral rinses against SARS-CoV-2 have been conducted in vitro, randomized clinical trials are needed to verify oral rinse effectiveness in preventing the spread of the virus, including evaluation of toothbrush disinfection. However, it is important to highlight that MEISTER et al. [1] showed the potential of an ethanol and essential oils combination to inhibit both different and mixed SARS-CoV-2 isolates. This makes it possible to apply the suggested protocol for disinfecting toothbrushes with the aim of preventing virus transmission in individual and collective contexts.

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Table 1. Oral rinses used by other studies to test the virucidal activity against SARS-CoV-2, with active compound, trade name, exposure time and efficacy.

Author, Year	Active Compound	Trade Name	Exposure Time (seconds)	Efficacy
Meister et al. [1]	Hydrogen peroxide	Cavex Oral Pre Rinse	30	Unsatisfactory
	Chlorhexidinebis (D-gluconate)	Chlorhexamed Forte	30	Unsatisfactory
	Dequalinium chloride, Benzalkonium chloride	Dequonal	30	Satisfactory
	Chlorhexidinebis (D-gluconate)	Dynexidine Forte 0.2%	30	Unsatisfactory
	Polyvidone-iodine	Iso-Betadine mouthwash 1.0%	30	Satisfactory
	Ethanol, Essential oils	Listerine Cool Mint	30	Satisfactory
	Octenidine dihydrochloride	Octenident mouthwash	30	Unsatisfactory
	Polyaminopropyl biguanide (polyhexanide)	ProntOral mouthwash	30	Unsatisfactory
Meyers et al.	Hydrogen peroxide (1.5%), Menthol (0.1%)	Orajel Antiseptic	30	Unsatisfactory

[7]		Rinse		
	Hydrogen peroxide (1.5%)	1.5% H2O2	30	Unsatisfactory
	Eucalyptol (0.092%), Menthol (0.042%), Thymol (0.064%)	Listerine Antiseptic	30	Satisfactory
	Eucalyptol (0.092%), Menthol (0.042%), Thymol (0.064%)	Listerine Ultra	30	Satisfactory
	Polyvidone-iodine (5%)	Betadine 5%	30	Satisfactory
Bidra et al. [6]	PVP-I 1.0% Oral Rinse	_____	15	Satisfactory
	PVP-I 2.5% Oral Rinse	_____	15	Satisfactory
	PVP-I 3.0% Oral Rinse	_____	15	Satisfactory
	H2O2 1.5%	_____	15	Unsatisfactory
	H2O2 3.0%	_____	15	Unsatisfactory