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Povidone-Iodine Solution as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Prophylaxis

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Abstract: ***Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a highly transmissible and pathogenic coronavirus that emerged in late 2019 and has caused a pandemic of acute respiratory disease, named 'coronavirus disease 2019' (COVID-19), which threatens human health and public safety.The COVID-19 pandemic has raised concerns of inadvertent SARS-CoV-2 transmission to healthcare providers during routine procedures of the aerodigestive tract in asymptomatic COVID-19 patients. The oral cavity, an essential part of the upper aerodigestive tract and the mucosa of the upper and lower airways is believed to play an important role in the pathogenicity and transmission of SARS-CoV-2.Current efforts to mitigate this risk focus on PersonalProtective Equipment, including high-efficiency filtration as well as other measures.Because the reservoir for SARS-CoV-2 shedding is in the nasopharynx and nasal and oral cavities,and significant proportion of COVID 19 sufferers are asymptomatic, but shedding these viral particles, PVP-I has been shown to be a safe therapy when used as a mouthwash or taken nasally or used during ophthalmic surgeries. Numerous studies have confirmed that povidone-iodine inactivates many common respiratory viruses, including SARS-CoV-1. Povidone-iodine also has good profile for mucosal tolerance. Thus, proposing a prophylactic treatment protocol for the application of topical povidone-iodine to the upper aerodigestive tract.***

Keywords: Betadine; COVID-19; Mouth wash; Viral load; Clinical trial ;Povidone-iodine; Prophylaxis; SARS-CoV-2; Upper Aerodigestive tract.

1. Purpose

To investigate the optimal contact time and concentration for viricidal activity of povidone-iodine (PVP-I) against SARS-CoV-2 ('corona virus') to mitigate the risk and transmission of the virus in the dental and medical practice(oral, nasal and pharyngeal surgery).

2. Materials and Methods

0.5% PVP-I solution is prepared from commercially available 10% PVP-I solution. Patients were instructed to put 0.5% PVP-I drops in nose and rinse mouth with gargle prior examinations for 30 s. For endoscopic procedure (nasal and throat) nasal douching and gargling to be started one day prior. Douching and rinsing to be repeated just before procedures. Nasal packing with 0.5% PVP-I along with 4% xylocaine/adrenaline solution, tolerability and any allergic reaction noted.

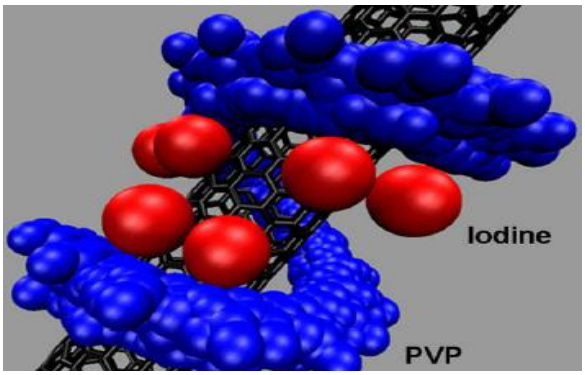

Figure 1: Molecular Structure Of Povidone – Iodine.

Table 1: Bactericidal activity of povidone-iodine 7% oral solution against gram-positive and -negative bacteria under dirty conditions

Bacteria	Povidone-iodine concentration (%)	Log10 reduction factor	
		15 s	30 s
Klebsiella pneumoniae	0.7	> 5.47	> 5.47
	0.23	5.35	> 5.47
	0.07	< 2.79	3.24
	0.007	< 2.79	< 2.79
Streptococcus pneumoniae	0.7	> 5.20	> 5.20
	0.23	> 5.20	> 5.20
	0.07	4.86	> 5.20
	0.007	< 2.52	< 2.52

Results shown in bold indicate bactericidal activity (≥ 5 log10 reduction factor compared with control)

Dirty conditions: 3.0 g/l bovine serum albumin + 3.0 ml/l erythrocytes

Table 2: Virucidal activity of povidone-iodine 7% oral solution against SARS-CoV, MERS-CoV, influenza virus A subtype H1N1 and rotavirus

Virus	Povidone-iodine concentration (%)	Log_{10} reduction factor with 95% confidence interval					
		Clean conditions[a]				Dirty conditions[b]	
		15 s	30 s	60 s	120 s	15 s	30 s
Influenza virus A subtype H1N1	0.23	**5.67 ± 0.43**	**5.67 ± 0.42**	n.d.	n.d.	**6.00 ± 0.47**	**6.00 ± 0.47**
	0.023	**4.50 ± 0.54**	**4.83 ± 0.68**	n.d.	n.d.	0.33 ± 0.63	0.50 ± 0.65
	0.0023	0.83 ± 0.54	1.00 ± 0.70	n.d.	n.d.	0.17 ± 0.58	0.17 ± 0.58
SARS-CoV	0.23	**4.60 ± 0.80**	n.d.	n.d.	n.d.	**4.40 ± 0.79**	n.d.
MERS-CoV	0.23	**4.40 ± 0.79**	n.d.	n.d.	n.d.	**4.40 ± 0.87**	n.d.
Non-enveloped human rotavirus strain Wa	0.23	**≥ 4.67 ± 0.42**	**≥ 4.67 ± 0.42**	**≥ 4.67 ± 0.42**	**≥ 4.67 ± 0.42**	n.d.	n.d.
	0.023	1.83 ± 0.54	2.00 ± 0.60	2.00 ± 0.60	2.17 ± 0.61	n.d.	n.d.
	0.0023	− 0.33 ± 0.42	0.00 ± 0.60	0.17 ± 0.61	0.67 ± 0.42	n.d.	n.d.

Results shown in bold indicate virucidal activity (≥ 4 log_{10} reduction in viral titre compared with control)
BSA bovine serum albumin, *MERS-CoV* Middle East respiratory syndrome coronavirus, *n.d.* not done, *SARS-CoV* severe acute respiratory syndrome coronavirus
[a]Clean conditions: 0.3 g/l BSA as interfering substance, except for rotavirus testing, which used distilled water
[b]Dirty conditions: 3.0 g/l BSA + 3.0 ml/l erythrocytes as interfering substance

3. Results

Povidone-iodine has been safely administered for up to 5 months in the nasal cavity and 6 months in the oral cavity. The patient and health care workers tolerated the 0.5%. No allergy was noted.PVP-I oral antiseptics at all tested concentrations of 0.5%, 1%, and 1.5%, completely inactivated SARS-CoV-2 within 15 seconds of contact. Concentrations less than 2.5% in vitro do not reduce ciliary beat frequency or cause pathological changes in ciliated nasal epithelium, upper respiratory, or mucosal cells. Adverse events with oral use have not been reported in conscious adults or children. Allergy and contact sensitivity is rare. Chronic mucosal use up to 5% has not been shown to result in clinical thyroid disease. PVP-I is rapidly virucidal and inactivates coronaviruses, including SARS-CoV and Middle East Respiratory Syndrome (MERS).To date, in vivo effectiveness of PVP-I against SARS-CoV-2 has yet to be established and possible risks of its direct use on upper aerodigestive mucosa of children must be weighed.

4. Conclusion

Such an approach represents a low-cost, low-morbidity measure that may reduce the risks associated with aerosol-generating procedures performed commonly in dental andin otorhinolaryngologyoperating rooms.Povidone-iodine can safely be used in the nose at concentrations up to 1.25% and in the mouth at concentrations up to 2.5% for up to 5 months. Povidone-iodine rapidly inactivates coronaviruses, including SARS and MERS, when applied for as little as 15 secondsThis important finding can justify the use of preprocedural oral rinsing with PVP-I (for patients and health care providers) may be useful as an adjunct to personal protective equipment, for dental and surgical specialties during the COVID-19 pandemic.There is optimism that PVP-I can inactivate SARS-CoV-2. Further research is required prior to strongly recommending PVP-I use in preparation for nasal, oral or pharyngeal surgery in children.

Declaration of Conflicting Interest

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