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Review Article

Intranasal Use of Povidone-Iodine in Reducing Nasopharyngeal Viral Load "Practice Innovation"

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Abstract

There are few effective prophylactic treatment options currently available for the novel coronavirus, and social distancing practices have thus far been the primary recommendation from health officials. The most prominent effects of COVID-19 are seen throughout the respiratory system and due to the high viral load present in the nasal cavity, this serves as a potential target location for virucidal agents. Povidone-Iodine (PVP-I) is a commonly used topical antiseptic that has demonstrated past success in reducing the viral load of human corona-viruses with a similar homology to COVID-19, namely SARS-CoV-1 and MERS. Recent evidence has demonstrated PVP-I have similar virucidal capabilities against SARS-CoV-2, the virus responsible for COVID-19. Nasal administration of PVP-I non-invasive and can be routinely done when used at low concentrations. PVP-I could be considered as a possible intervention in reducing the transmission rate of COVID-19, particularly in high risk populations.

Keywords: Povidone-iodine; Nasal irrigation; SARS-CoV-2

Introduction

The COVID-19 pandemic, caused by Severe Acute Respiratory Syndrome-Coronavirus 2 (SARS-CoV-2), is highly infectious in nature and can be transmitted *via* respiratory droplets and aerosols [1]. While treatment has thus far focused primarily on supportive therapy for afflicted individuals, there are various promising virucidal therapies currently under investigation. Reducing transmission of COVID-19 has proven difficult as those who have contracted the virus are often asymptomatic and continue to be in contact with the general public [2]. This is particularly true in Long Term Care (LTC) facilities, which have borne the brunt of the pandemic's illness and death in Canada and other countries.

A particularly high viral load is found in the nasal cavity and nasopharynx, suggesting potential viability for decontamination of the nose to reduce viral spread [1]. Povidone-iodine (PVP-I) has been shown to be effective in the inactivation of SARS-CoV-2 and past research has proven its ability to act as an effective inactivator of human coronaviruses bearing a similar homology [3]. As a commonly used antiseptic in dental practices and surgical procedures, PVP-I has a well-established safety profile when used at low concentrations[4]. Based on past usage of PVP-I, there is reason to believe that an intranasal application of this antiseptic could have value in the treatment and prophylaxis of COVID-19 in LTC facilities.

What is povidone-iodine nasal irrigation?

PVP-I is a topical broad purpose antiseptic that can be used in various anatomical locations including the eyes, nose and mouth. Routine nasal administration of PVP-I has been used to treat symptoms of Chronic Rhinosinusitis (CRS), presurgical antisepsis and as a preventative measure against COVID-19 for health care workers and patients [1,4]. The iodine, once free from the polymer, contained in PVP-I is capable of irreversibly disrupting pathogenic activity, resulting in viral and bacterial reduction[4].PVP-I has been able to effectively inactivate previous human coronaviruses such as SARS-CoV-1 and MERS, and a recent study has shown that an oral antiseptic preparation of PVP-I was capable of inactivating SARS-CoV-2 *in vitro* [3].

How is povidone-iodine nasally delivered?

Povidone-iodine can be administered nasally via a number of different methods. Institutions currently using PVP-I intranasally in order to reduce contraction and transmission of COVID-19 in health care worker and patient populations have used application methods such as nostril drops, nasal packing and nasal douching [2]. Other methods employed in clinical practices include nasal scrubs, swab sticks, salts as well as sinus rinse delivery bottles [1]. Evidence exists suggesting that a liposomal formulation of PVP-I is the most effective means of antisepsis in the nasal mucosa when delivered with a spray device [5]. Due to its phospholipid bilayer, this form of PVP allows for directed cell delivery and a more controlled release of its contents [5]. General guidelines recommend a concentration of 0.2% to 0.5% PVP-I for repeated intranasal use [1].

Who is eligible for povidone-iodine nasal irrigation?

Nasal irrigation *via* PVP-I can be accomplished with relative ease, making it an accessible treatment option for a number of populations. Of particular interest for distribution are asymptomatic individuals in pursuit of limiting transmission rates due to the non-invasive nature of application [2]. This may be particularly relevant in higher risk populations such as institutionalized care facilities where isolation and contact reduction is impractical due to care related needs. Nasal administration of PVP-I is unsafe for individuals undergoing radioactive iodine treatment due to competition with thyroid radioactive iodine uptake [1].

What are the harms?

PVP-I is a commonly used antiseptic and evidence from a number of studies and practices suggest it has a strong overall

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safety profile [1,4]. However, the concentration of PVP-I should be noted as potential for toxicity increases with concentrations above 2.5% when used *in* vitro [1]. Upon the application of 5% and 10% PVP-I solution to human sinonasal epithelia, a drop in ciliary beat frequency occurred [6]. In a study investigating the effect of nasal irrigations on human nasal epithelial cells, Ramezanpour et al. [4], demonstrated that a 30-minute exposure of 0.5% PVP-I significantly reduced Transepithelial Electrical Resistance (TEER) [4]. Routine administration of 0.5% PVP-I have resulted in some reports of mild discomfort [2].

What is the evidence so far?

An oral formulation of PVP-I was tested on cell cultures of the SARS-CoV-2, USA-WA1/2020 strain and significant viral reduction was reported 15 seconds post contact time[2].Past research has shown PVP-I to be an effective virucidal agent against previous human coronaviruses such as SARS-CoV-1 and MERS [1]. As of October 17, 2020, there are 12 clinical trials registered examining the utility of iodine in reducing viral load in COVID-19 patients, and three trials examining its use for prophylaxis in high-risk groups [7].

The current literature investigating the intranasal use of povidone-iodine suggests that repeated administration of a low concentration (generally between 0.2% and 0.5%) did not demonstrate signs of toxicity or damage to any of the prime markers of nasal function including olfaction, ciliary activity or mucosal ultrastructural appearance [1]. Some practices have chosen to adopt a protocol of oral and nasal rinsing using 0.5% PVP-I as a preventative measure against COVID-19 for health care workers and patients alike with no adverse effects reported thus far [2].

What can be expected in the future?

The above evidence suggests a virucidal agent administered as a nasal spray or wash could be effective in reducing viral load and thereby transmission [2]. PVP-I has been shown to be an effective virucidal agent against SARS-CoV-2 when tested as an oral formulation [3], suggesting nasally applied PVP-I solution would have a similar effect. This use of PVP-I could be of particular value to vulnerable patient populations, such as those residing in institutionalized care facilities, in order to reduce risk of transmission and contraction. Additionally, there would be value in investigating the most advantageous delivery method of povidone-iodine to target cells and the potential benefits of using a liposomal formulation [5]. Further research is needed for confirmation of the efficacy of this treatment option and whether a possible expansion to include lower risk and asymptomatic individuals is appropriate.

Key Points

- PVP-I has been proven as an effective virucidal against human corona-viruses similar to SARS-CoV-2
- Recent evidence suggests PVP-I is capable of inactivating SARS-Cov-2
- Potential viability for use in asymptomatic or high-risk patient populations in LTC facilities due to non-invasive method of delivery
- Intranasal application of povidone-iodine could be used for prophylaxis of COVID-19 in LTC facilities.

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