

## Nasal and Oral Decontamination is Vital in Mitigating Spread of COVID-19

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The novel Coronavirus Disease 2019 (COVID-19) that first appeared in Wuhan China in late 2019 has spread worldwide. The WHO declared the spread of COVID-19 a global pandemic on March 11th. This has led to drastic changes in the routine practice of medicine. State and local governments have restricted non-urgent patient visits, suspended elective surgical procedures and prohibited all health-care activities deemed to be non-essential. This has limited the ability to practice in both primary care and specialties. Doctors are working swiftly and in unison to solve the resulting practice management problems, along with building consensus opinions as how to approach unique patient issues using telemedicine, virtual visits and other technology-enabled practices. This is happening not only within specialties but across them as well, with the common goal of treating patients in the safest way possible until office doors can safely reopen. There has been intense discussion in the medical literature describing approaches to accommodate the new dynamics of patient care in the era of a highly contagious viral pandemic.

Much has been learned about COVID-19 in a short period of time. Transmission occurs by skin-to-skin contact with an infected person, aerosolization of infectious virus particles or by touching contaminated items (fomites: patient care equipment, telephones, TV remote controls, countertops, bedding, etc.). Hand to face transmission is now thought to play a vital role in the spread [1]. This is compounded by the significant risk of nosocomial transmission to non-infected patients already hospitalized, with one study reporting 41% of their patients contracting the infection in this manner [2]. Critical care, for example, represents a high-risk environment for nosocomial transmission of SARS-CoV-2 with procedures such as non-invasive ventilation, intubation and suction causing a bioaerosol that may represent more of a potential inoculum than by community transmission [3]. Attention has been focused on the importance of Personal Protective Equipment (PPE). Masks, face shields, gloves and gowns form the physical line of defense to protect front line workers from becoming infected in the course of providing patient care [4]. New protocols specific to PPE use by the healthcare workforce active in the fight against COVID-19 are being developed.

Viral loads present in clinical samples have pinpointed reservoirs of infectious virus particle production and peak transmission time of virus. RT-PCR assays have demonstrated high viral loads in respiratory samples (nasal, throat swabs and sputum), along with fecal samples [5]. The upper respiratory tract is specifically susceptible to infection by the SARS-CoV-2 virus. Like SARS-CoV, it demonstrates specific tropism for the ACE2 receptor. This receptor is abundantly expressed in nasal goblet and ciliated cells indicating that the upper airway may be preferentially infected early in the disease making these cells a potential reservoir for SARS-CoV-2 infection. Because SARS-CoV-2 is an enveloped virus, its release does not require cell lysis. The virus can exploit existing secretory pathways in nasal goblet cells for low-level, continuous-release at the early stage with no overt pathology. These

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discoveries have clinical implications with respect to targeting nasal epithelial cells, especially nasal goblet cells, beyond the current usage of face masks, providing a clinical option for transmission prevention and/or early-stage intervention [6]. Several front-line workers have already described transmission mitigation protocols that involve not only masks but frequent nasal antiseptics for both patients and providers.

Another important vector is saliva. In a small case series, live coronavirus was detected in the self-collected saliva of 91.7% (11/12) of patients. Serial saliva viral load monitoring generally showed a declining trend. Saliva is a recently approved non-invasive specimen for diagnosis, monitoring, and infection control in patients with COVID-19 [7]. The presence of viral RNA has also been discovered in the tears. This is a potential hazard to healthcare workers in close contact with the face and specifically the eyes of COVID-19 patients [8]. Ophthalmologists in China were among the first to recognize the emergence of a new SARS-like viral syndrome and have sadly been counted as some of the earliest casualties among medical doctors.

The importance of frequent antiseptic use has been broadly recognized. Most attention is focused on alcohol-based hand sanitizer, and the scarcity of it has led to at-home production. Unconventional producers like distilleries and perfumeries are reorienting their manufacturing lines to meet demand. Non-alcohol based antiseptics are gaining particular interest as nasal and oral decontamination agents.

Aqueous povidone-iodine (PVP-I) products have been popular pre-procedural antiseptics for years because of their resistance-free anti-bacterial, antiviral, anti-fungal and anti-protozoal activity. These properties lend themselves to far greater applications than pre-surgical preps.

The versatility of PVP-I in dermatology has been demonstrated in clinical trials for over a decade in various formulations for numerous indications. The broad anti-microbial coverage and lack of resistance of PVP-I has proven efficacious, safe and well tolerated in treating on-

ychomycosis, verruca vulgaris, molluscum contagiosum, and chemotherapy-associated paronychia [9-15]. As recently as 2015, PVP-I has been shown to be specifically virucidal to coronaviridae on surfaces. Anti-viral studies have shown that PVP-I is effective against SARS-CoV and MERS-CoV, the coronaviridae responsible for previous outbreaks or SARS and MERS [16,17]. It is also extremely effective against biofilms [18].

PVP-I has demonstrated utility against known vectors of transmission for COVID-19. PVP-I has been used safely in the nasal cavity and sinuses to treat a variety of conditions. Dilute 0.08% topical PVP-I sinonasal rinsing solution has been used as an ancillary therapy for recalcitrant chronic rhinitis, significantly reducing endoscopic signs of infection and inflammatory markers without affecting thyroid function, mucociliary clearance or olfaction [19]. PVP-I is currently used as a Methicillin-resistant *Staphylococcus aureus* (MRSA) reducing preoperative preparation for application to the nasal passages [20,21]. A single application of PVP-I before surgery was shown effective in eliminating nasal *Staphylococcus aureus* (*S. aureus*) in over two-thirds of patients [22]. Off-the-shelf PVP-I swabs were not as effective as products specifically designed for products for *S. aureus* nasal decolonization [23].

For oral decontamination, PVP-I 7% gargle/mouthwash showed rapid bactericidal activity and virucidal efficacy *in vitro* at a concentration of 0.23%. PVP-I may provide a protective oropharyngeal hygiene measure for individuals at high risk of exposure to oral and respiratory pathogens. Protocols involving PVP-I gargle could become useful when used carefully at times of highest transmission risk [24]. PVP-I is already produced for use as a 1% w/w mouthwash every 2-4 hours and as a 0.45% w/w 'sore throat spray' [25,26].

Dermatologists have long used mupirocin ointment in the nares to decrease/eradicate MRSA colonization of the nose [27]. At the outbreak of COVID-19, the importance of broadening this approach to include dilute intranasal PVP-I as an adjunctive measure to reduce the aerosolization of infectious COVID-19 virus particles became apparent. When in contact with patients, my office has adopted the practice of applying dilute PVP-I gel to the nares with large cotton swabs before donning and after doffing masks. This practice has been well tolerated. All healthcare workers should consider employing the same nasal antiseptic regime in addition to routine mask use just as hand-washing is used with routine glove use. Much like the universal mask policy of "my mask protects you and your mask protects me", regular oral and nasal decontamination strategies could act in a manner similar to hand washing as a method to further reduce the likelihood of viral transmission. We may soon learn that masks are not enough. Nasal antiseptic with appropriate PVP-I formulations in addition to the use of masks may provide the most effective protection yet against transmission of this highly infectious pathogen.

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