

Reducing transmission of SARS-CoV-2 in ophthalmology with nasal and oral decontamination

Jesse S. Pelletier¹ , Kevin Stewart and Belachew Tessema

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Dear Editor,

The ongoing COVID-19 pandemic has radically changed the practice of ophthalmology. Steps have been taken to mitigate SARS-CoV-2 spread through federal, state, and local policies aimed at reducing viral transmission. The most disruptive of these has been the restriction of routine ophthalmology clinic visits and the suspension of elective nonurgent surgical procedures. As the pandemic unfolds and policies are loosened, attention will focus on the reopening of physician practices and ambulatory surgery centers. Preparing for these changes is essential as both healthcare personnel (HCP) and patients will face increased exposure to this novel pathogen.

The widespread distribution of this disease has for the first time given many of us an up close look at the clinical course, transmission dynamics, and control measures as they evolve in a complex public health emergency. It has been apparent from case descriptions that although the eye may contain infectious virion, the nasal cavity, nasopharynx, oral cavity, and oropharynx are more important routes of transmission.¹ It is known that ciliated nasal epithelial cells are particularly susceptible because of high angiotensin-converting enzyme (ACE2) expression and that nasal surfaces may represent the initial dominant site of SARS-CoV-2 infection.² Ophthalmologists remain at risk because of infectious aerosols generated from close, sustained patient contact, high patient volume, and specific surgical procedures.

Given the scope of this pandemic, a broadly applicable set of procedures useful as anti-COVID-19 measures should be adopted specifically for the ophthalmic setting. Such an approach would be based on experience with antisepsis and best available evidence to protect HCP and

patients alike. Infection control currently relies on three levels of hierarchy which include administrative protocols, environmental protocols, and the utilization of transmission-based precautions for healthcare workers.³ The latter, in the form of personal protective equipment (PPE) and the donning of masks, comprises the foundation of a strategy designed to prevent aerosolized virus from reaching new hosts. We believe that, additionally, nasal and oral decontamination measures may be implemented to reduce viral aerosolization before it reaches barriers, surfaces, and fomites.

Nasal and oral decontamination is currently a routine step used to reduce postoperative infectious contamination across many surgical subspecialties. Such a strategy could be applied to reduce the aerosolization of shed virus particles in an effort to mitigate transmission. Routine decontamination should be an important adjunct to PPE and be considered any time a mask is either placed or removed in the healthcare setting, just as handwashing is employed before and after the use of gloves. In those who are actively shedding virus from the upper respiratory tissues only, it is possible that oral and nasal cleansing would not only reduce outward bound virion and transmissivity but also decrease retrograde microaspirations generated from the oral-lung axis. In those who are not yet infected, prophylactic therapy may ward off infection altogether or reduce its severity.

Among the commonly used antiseptics which may be considered for this task, only a few have significant antiviral activity. Povidone-iodine (PVP-I) is nearly universally virucidal and has recently shown rapid *in vitro* inactivation of SARS-CoV-2.⁴ Oral PVP-I gargles are employed in Japan for both prevention and treatment of

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Correspondence to:

Jesse S. Pelletier
Ocean Ophthalmology
Group, 1400 NE Miami
Gardens Drive, Ste 203,
North Miami Beach, FL
33179, USA.
[jesse.pelletier@](mailto:jesse.pelletier@oceanophthalmology.com)
oceanophthalmology.com

Kevin Stewart
Plessen Ophthalmology,
Christiansted, VI, USA

Belachew Tessema
ProHealth Ear Nose and
Throat, Farmington, CT,
USA

upper respiratory tract infections (URTIs) caused by influenza like illnesses and the common cold.⁵ As a mouthrinse, it demonstrates a sustained antimicrobial effect lasting up to 4 h.⁶ When administered to the sinuses, PVP-I plays an important role as an adjuvant therapy in chronic rhinosinusitis.⁷ Its nasal application has proved paramount in the reduction of surgical site infections.⁸ Importantly, PVP-I is trusted by ophthalmologists as years of supportive data attest to its ability to disinfect the ocular surface.

The safe, repeated, topical application of PVP-I has been reported across multiple subspecialties, and clinical trials are underway to assess PVP-I in diverse COVID-19 settings. In further support of safety, *in vitro* data measured by ciliary beat function reveal that solutions containing up to 1.25% PVP-I are nontoxic to nasal epithelial cells.⁹ Moreover, projected iodine penetration can be assessed with quantitative absorption studies.¹⁰ With an infinite dose depot of 10% PVP-I, the maximum expected I₂ absorption after only a few minutes of rinsing the nasal passages is on the order of 5–10 µg. A protocol, using only 0.5% PVP-I, would deliver no more than 2.0–8.0 µg of iodine daily, likely even lower based on the very short contact times. PVP-I protocols with concentrations high enough to ensure reliable efficacy but low enough to ensure that they are safe with repeated dose administration would be useful and may be tailored to specific ophthalmic settings.

We recognize that the exact virucidal duration of PVP-I on mucosal surfaces *in vivo* remains unknown. Clinical studies of PVP-I *in vivo* support a durable, protective effect against bacteria and possibly SARS-CoV-2.¹¹ There are, significant differences between the replication of bacteria and virus. Bacteria are known to replicate autonomously, while viruses must take over cellular machinery to produce infectious virion, a process that eventually exhausts the host cell. Viruses also shed not only through exocytosis to the extracellular space but also undergo cell-to-cell transmission through the process of macropinocytosis. *In vitro* studies have established that once epithelial cells have been exposed to SARS-CoV, infection may take 4 h or longer. Despite these variables, we believe that a reasonable treatment window will be created and that potential benefits of such a strategy outweigh the risks.¹²

Nasal and oral decontamination strategy should be effective and convenient for use in outpatient

ophthalmic clinics and ambulatory surgery centers (ASCs) in both developed and developing countries alike. We consider this additional step to be an enhancement of ‘standard precautions’, reflecting the notion that virion transmission is possible in any setting and that the donning of masks and PPE may be insufficient. Much like the wearing of protective masks, its implementation should ideally involve the decontamination of both the HCP and patient to maximize reciprocity. These principals may moreover be applied to other healthcare settings and other communities at risk. The challenges of a COVID-19 world are many. Because there exists no vaccine or substantially mitigating therapy, we must protect both ourselves and our patients using shared experience and common sense until randomized controlled trials are better able to illuminate the path forward.

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ORCID iD

Jesse S. Pelletier  <https://orcid.org/0000-0003-2076-9848>

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