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# June 2020 COVID-19 Update

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We continue to learn about the second coronavirus (CoV) to cause severe adult respiratory syndrome (SARS), named SARS-CoV-2, which is responsible for the present pandemic of the coronavirus disease that started in 2019 in China (COVID-19). The following referenced information is meant to supplement the 3/16/20, 4/1/20, and 5/1/20 ACPeds articles.

An important recent revelation has been that the gene for the angiotensin-converting enzyme 2 (ACE2) receptor that allows cells to get infected with SARS-CoV-2 is actually highly enriched in the surface cells of the tongue.[1] That has major implications regarding transmission and testing. Saliva or tongue scrapings may be superior diagnostic specimens, short of coughed up sputum, in the first week of symptoms, and an antigen test (rather than the RNA test widely used) may be cheaper yet reliable for detecting the virus.[2] Talking, singing, and certainly kissing, could spread the virus to close contacts in days prior to developing any symptoms. Mean ACE2 gene expression in epithelial cells of the tongue is almost 7[1] [$\log_2$ counts per million] compared to levels of less than 3.5 in nasal mucosa.[3] Infection in the mouth may not cause symptoms, other than potential taste dysfunction, while allowing for spread of the virus by saliva droplets. Nasal mucosa being the initial infection site would likely be associated with more nasal symptoms, as is the case with most other respiratory viruses. Although anosmia (loss of smell) was seen in up to 47% of COVID-19 adults, and more (57%) of those patients also had rhinorrhea, anosmia is rarely seen as a first symptom.[4] Thus, I think that it is likely that most SARS-CoV-2 infections start on the tongue before spreading to the nasopharynx, lungs, and/or gastrointestinal tract. That could also explain the long incubation period of COVID-19 compared to other respiratory viral infections.

After the first week of symptoms, antibody testing (serology) may be as effective if not more so in diagnosing COVID-19.[5] Serology will probably be a more cost-effective way of identifying infected asymptomatic contacts of known cases, as the IgG antibodies rise within 1 to 3 weeks of infection.[6,7] Interestingly, the IgM antibodies that usually rise first with new infections, often rise no earlier than IgG,[7] and have been undetectable in patients with mild symptoms but prolonged viral shedding.[8-10] Rises in IgM may be important in clearing of the virus.[8] Up to 6% of SARS-CoV-2-infected individuals fail to develop detectable IgG or IgM antibodies.[9,11,12]

For children, the latest concerns have been the recently identified multisystem inflammatory syndrome of childhood (MIS-C) and the challenges of school and daycare. MIS-C has recently come to light as a rare but serious Kawasaki-like disease of children, mostly older than 4 years

of age, who experienced or were exposed to COVID-19 within recent weeks.[13,14] See our recent posting about MIS-C.

The concerns for reopening daycares and schools is that they are prime environments for spreading infectious diseases, and face coverings as well as social distancing may prove difficult if not impossible in those settings. Some experts have suggested that children may not transmit SARS-CoV-2 as well as adults, and that they may also not be as susceptible.[15] Yet children can have viral loads as high or higher than adults.[16,17] Possible explanations for the lesser morbidity from COVID-19 in children include the idea that they might have less ACE2 receptors in their lungs (having less expression of ACE2 has been found in nasal mucosa of young children compared to older children and adults),[3] they might have cross-protection from circulating cold-causing human coronaviruses, and that they might have a better immune response with less cytokine release than adults.[18] Facial barriers (masks or shields) as well as hand and surface sanitation are believed to be helpful in preventing transmission,[18] so reliance on those measures may be necessary for children who are able to comply when social distancing is not achievable. Studies are needed to evaluate different mitigation strategies to better guide public policy. Viral as well as serologic testing is needed to help answer questions about the effect of children returning to group environments like daycares and schools.

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