SARS-CoV-2 and the Role of Orofecal Transmission: Evidence Brief

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References: Included Studies

Ahmed W, Angel N, Edson J et al. First confirmed detection of SARS-CoV-2 in untreated wastewater in Australia: A proof of concept for the wastewater surveillance of COVID-19 in the community. Science of The Total Environment. 2020;728:138764. https://doi.org/10.1016/j.scitotenv.2020.138764

Amirian ES. Potential fecal transmission of SARS-CoV-2: Current evidence and implications for public health. Int J Infect Dis. 2020;95(1878-3511):363-70. https://doi.org/10.1016/j.ijid.2020.04.057

Cahill N, Morris D. Recreational waters - A potential transmission route for SARS-CoV-2 to humans? [published online ahead of print, 2020 Jun 11]. Sci Total Environ. 2020;740:140122. https://doi.org/10.1016/j.scitotenv.2020.140122

Chavarria-Miró G, Anfruns-Estrada E, Guix S et al. Sentinel surveillance of SARS-CoV-2 in wastewater anticipates the occurrence of COVID-19 cases. medRxiv. 2020:2020.06.13.20129627

Chen Y, Wang AH, Yi B, et al. Zhonghua Liu Xing Bing Xue Za Zhi. 2020;41(5):667-671. doi:10.3760/cma.j.cn112338-20200304-00251

Chen Y, Chen L, Deng Q, et al. The presence of SARS-CoV-2 RNA in the feces of COVID-19 patients. J Med Virol. 2020;92(7):833-840. doi:10.1002/jmv.25825

Cheung KS, Hung IFN, Chan PPY, et al. Gastrointestinal manifestations of SARS-CoV-2 infection and virus load in fecal samples from a Hong Kong cohort: systematic review and meta-analysis [published online ahead of print, 2020 Apr 3]. Gastroenterology. 2020;S0016-5085(20)30448-0. doi:10.1053/j.gastro.2020.03.065

Ding S, Liang TJ. Is SARS-CoV-2 also an enteric pathogen with potential fecal-oral transmission? A COVID-19 virological and clinical review [published online ahead of print, 2020 Apr 27]. Gastroenterology. 2020;S0016-5085(20)30571-0. doi:10.1053/j.gastro.2020.04.052

Ding Z, Qian H, Xu B et al. Toilets dominate environmental detection of SARS-CoV-2 virus in a hospital.2020. medRxiv 2020.04.03.20052175; doi: https://doi.org/10.1101/2020.04.03.20052175

Donà D, Minotti C, Costenaro P, Da Dalt L, Giaquinto C. Fecal-Oral Transmission of SARS-CoV-2 In Children: is it Time to Change Our Approach?. Pediatr Infect Dis J. 2020;39(7):e133-e134. doi:10.1097/INF.0000000000002704

Gupta S, Parker J, Smits S, Underwood J, Dolwani S. Persistent viral shedding of SARS-CoV-2 in faeces - a rapid review. Colorectal Dis. 2020;22(6):611-620. doi:10.1111/codi.15138

Han C, Duan C, Zhang S, et al. Digestive symptoms in COVID-19 patients with mild disease severity: clinical presentation, stool viral RNA testing, and outcomes. Am J Gastroenterol. 2020. doi:10.14309/ajg.0000000000000664

Kim J-M, Kim HM, Lee EJ et al. Osong Public Health Res Perspect. 2020 Jun; 11(3): 112–117. doi: 10.24171/j.phrp.2020.11.3.02

Kingsbury J, Lake R. Potential for foodborne transmission of COVID-19: literature review update. New Zealand Food Safety & Science Research Centre. 2020. https://www.unitedfresh.co.nz/assets/COVID-19/United-Fresh---Potential-for-Foodborne-Transmission-of-Covid-19---Literature-Review-Update-19-May-20.pdf

La Rosa G, Bonadonna L, Lucentini L, Kenmoe S, Suffredini E. Coronavirus in water environments: Occurrence, persistence and concentration methods - A scoping review. Water Res. 2020;179:115899. doi:10.1016/j.watres.2020.115899

La Rosa G, Iaconelli M, Mancini P, Bonanno Ferraro G, Veneri C, Bonadonna L, et al. First detection of SARS-COV-2 in untreated wastewaters in Italy. medRxiv. 2020:2020.04.25.20079830.

Medema G, Heijnen L, Elsinga G, Italiaander R, Brouwer A. Presence of SARS-Coronavirus-2 in sewage. medRxiv. 2020:2020.03.29.20045880.

Parasa S, Desai M, Thoguluva Chandrasekar V, et al. Prevalence of gastrointestinal symptoms and fecal viral shedding in patients with coronavirus disease 2019: a systematic review and

meta-analysis. JAMA Netw Open. 2020;3(6):e2011335. Published 2020 Jun 1. doi:10.1001/jamanetworkopen.2020.11335

Santos VS, Gurgel RQ, Cuevas LE, Martins-Filho PR. Prolonged fecal shedding of SARS-CoV-2 in pediatric patients. A quantitative evidence synthesis [published online ahead of print, 2020 May 22]. J Pediatr Gastroenterol Nutr. 2020;10.1097/MPG.0000000000002798. doi:10.1097/MPG.0000000000002798

Shim E, Tariq A, Choi W, Lee Y, Chowell G. Transmission potential and severity of COVID-19 in South Korea. Int J Infect Dis. 2020;93:339-344. doi:10.1016/j.ijid.2020.03.031

Tian Y, Rong L, Nian W, He Y. Review article: gastrointestinal features in COVID-19 and the possibility of faecal transmission. Aliment Pharmacol Ther. 2020;51(9):843-851. doi:10.1111/apt.15731

Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in different types of clinical specimens. JAMA. 2020;323(18):1843–1844. doi:10.1001/jama.2020.3786

Wang XW, Li J, Guo T, et al. Concentration and detection of SARS coronavirus in sewage from Xiao Tang Shan Hospital and the 309th Hospital of the Chinese People's Liberation Army. Water Sci Technol. 2005;52(8):213-221.

Wu Y, Guo C, Tang L, et al. Prolonged presence of SARS-CoV-2 viral RNA in faecal samples. Lancet Gastroenterol Hepatol. 2020. 10.1016/S2468-1253(20)30083-2

Xiao F, Tang M, Zheng X, Liu Y, Li X, Shan H. Evidence for gastrointestinal infection of SARS-CoV-2. Gastroenterology. 2020. 10.1053/j.gastro.2020.02.055

Xiao F, Sun J, Xu Y, et al. Infectious SARS-CoV-2 in Feces of Patient with Severe COVID-19 [published online ahead of print, 2020 May 18]. Emerg Infect Dis. 2020;26(8):10.3201/eid2608.200681. doi:10.3201/eid2608.200681

Xu Y, Li X, Zhu B, et al. Characteristics of pediatric SARS-CoV-2 infection and potential evidence for persistent fecal viral shedding. Nat Med. 2020;26(4):502-505. doi:10.1038/s41591-020-0817-4

Yong Z, Cao C, Shuangli Z et al. Isolation of 2019-nCoV from a Stool Specimen of a Laboratory-Confirmed Case of the Coronavirus Disease 2019 (COVID-19)[J]. China CDC Weekly, 2020, 2(8): 123-124. doi: 10.46234/ccdcw2020.033

Yuan C, Zhu H, Yang Y, et al. Viral loads in throat and anal swabs in children infected with SARS-CoV-2. Emerg Microbes Infect. 2020;9(1):1233-1237. doi:10.1080/22221751.2020.1771219

Zang R, Castro MFG, McCune BT et al. The SARS-CoV-2 virus infects cultured ACE2-expressing human enterocytes aided by the TMPRSS2 and TMPRSS4 serine proteases. Science Immunology 13 May 2020: Vol. 5, Issue 47, eabc3582 DOI: 10.1126/sciimmunol.abc3582

Zhang J, Wang S, Xue Y. Fecal specimen diagnosis 2019 novel coronavirus-infected pneumonia. J Med Virol. 2020. 10.1002/jmv.25742

Zhang T, Cui X, Zhao X, et al. Detectable SARS-CoV-2 viral RNA in feces of three children during recovery period of COVID-19 pneumonia. J Med Virol. 2020;92(7):909-914. doi:10.1002/jmv.25795

Zhang W, Du RH, Li B, et al. Molecular and serological investigation of 2019-nCoV infected patients: implication of multiple shedding routes. Emerg Microbes Infect. 2020;9(1):386-389. https://doi.org/10.1080/22221751.2020.1729071

Zhou J, Li C, Liu X, et al. Infection of bat and human intestinal organoids by SARS-CoV-2 [published online ahead of print, 2020 May 13]. Nat Med. 2020;10.1038/s41591-020-0912-6. doi:10.1038/s41591-020-0912-6

References: Other

1. Transmission of SARS-CoV-2: implications for infection prevention precautions https://www.who.int/news-room/commentaries/detail/transmission-of-sars-cov-2-implications-for-infection-prevention-precautions

2. Patient-derived mutations impact pathogenicity of SARS-CoV-2 Hangping Yao et al .https://www.medrxiv.org/content/10.1101/2020.04.14.20060160v2.full.pdf

3. Holmes K.V. Enteric infections with coronaviruses and toroviruses. Novartis Found Symp. 2001;238:258–269. discussion 269–275.

4. Ye G, Lin H, Chen S, et al. Environmental contamination of SARS-CoV-2 in healthcare

5. Ong SWX, Tan YK, Chia PY, et al. Air, Surface Environmental, and Personal Protective Equipment Contamination by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) From a Symptomatic Patient. *JAMA.* 2020;323(16):1610–1612. doi:10.1001/jama.2020.3227

6. Guo ZD, Wang ZY, Zhang SF, et al. Aerosol and Surface Distribution of Severe Acute

7. Wang J, Feng H, Zhang S, et al. SARS-CoV-2 RNA detection of hospital isolation wards

8. Zhou J et al. Human intestinal tract serves as an alternative infection route for Middle East respiratory syndrome coronavirus. Sci Adv. 2017;3:eaao4966. https://advances.sciencemag.org/content/3/11/eaao4966

9. Lee SS, Wong NS. Probable transmission chains of Middle East respiratory syndrome coronavirus and the multiple generations of secondary infection in South Korea. Int J Infect Dis. 2015 Sep; 38():65-7.

10. Further studies on human enteric coronaviruses. Caul EO, Egglestone SI.

11. Booth CM et al. Clinical features and short-term outcomes of 144 patients with SARS in the greater Toronto area. JAMA. 2003;289:2801–2809.

12. Leung WK, To K-F, Chan PKS, Chan HLY, Wu AKL, Lee N, Yuen KY, Sung JJY. Enteric involvement of severe acute respiratory syndrome-associated coronavirus infection. Gastroenterology 125, 1011–1017 (2003).

13. Hung IFN et al. Viral loads in clinical specimens and SARS manifestations. Emerg. Infect. Dis. 10, 1550–1557 (2004).

14. Peiris JSM et al. Clinical progression and viral load in a community outbreak of coronavirus-associated SARS pneumonia: a prospective study. Lancet. 2003;361:1767–1772.

15. WHO environmental health team reports on Amoy gardens. Available at: http://www.info.gov.hk/gia/general/200305/16/0516114.htm.

16. Ding Y, He L, Zhang Q, et al. Organ distribution of severe acute respiratory syndrome (SARS) associated coronavirus (SARS-CoV) in SARS patients: implications for pathogenesis and virus transmission pathways. *J Pathol*. 2004;203(2):622-630. doi:10.1002/path.1560

17. Wang XW, Li JS, Guo TK, et al. Concentration and detection of SARS coronavirus in sewage from Xiao Tang Shan Hospital and the 309th Hospital [published correction appears in J Virol Methods. 2005 Dec;130(1-2):210]. *J Virol Methods*. 2005;128(1-2):156-161. doi:10.1016/j.jviromet.2005.03.022

18. Analysis of SARS-CoV-2 transmission clusters and superspreading events Gwen Knight, Quentin Leclerc and Adam Kucharski, on behalf of CMMID working group Report for SPI-M, 3rd June 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897562/S0473_SPI-M_Superspreading_and_clusters.pdf

19. Hartmann, Katrin (2005). "Feline infectious peritonitis". *Veterinary Clinics of North America: Small Animal Practice*. **35** (1): 39–79. doi:10.1016/j.cvsm.2004.10.011

20. Immune evasion of porcine enteric coronaviruses and viral modulation of antiviral innate signaling.

21. Fan Y, Zhao K, Shi ZL, Zhou P. Bat Coronaviruses in China. *Viruses*. 2019;11(3):210. Published 2019 Mar 2. doi:10.3390/v11030210

22. Killerby ME, Biggs HM, Midgley CM, Gerber SI, Watson JT. Middle East Respiratory Syndrome Coronavirus Transmission. Emerg Infect Dis. 2020;26(2):191-198. https://dx.doi.org/10.3201/eid2602.190697