

# UC Office of the President

## Research Grants Program Office (RGPO) Funded Publications

### Title

Letter to the Editor Regarding: “An Imperative Need for Research on the Role of Environmental Factors in Transmission of Novel Coronavirus (COVID-19)” □ Secondhand and Thirdhand Smoke As Potential Sources of COVID-19

### Permalink

<https://escholarship.org/uc/item/9137556p>

### Journal

Environmental Science and Technology, 54(9)

### ISSN

0013-936X

### Authors

Mahabee-Gittens, E Melinda

Merianos, Ashley L

Matt, Georg E

### Publication Date

2020-05-05

### DOI

10.1021/acs.est.0c02041

Peer reviewed

# Letter to the Editor Regarding: “An Imperative Need for Research on the Role of Environmental Factors in Transmission of Novel Coronavirus (COVID-19)” —Secondhand and Thirdhand Smoke As Potential Sources of COVID-19

 Cite This: <https://dx.doi.org/10.1021/acs.est.0c02041>

 [Read Online](#)

ACCESS |

 Metrics & More

 Article Recommendations

Due to the strict but necessary mandated social isolation imposed across the globe to decrease the spread of novel coronavirus (COVID-19), the current prevalence of electronic cigarette (e-cigarette) and combustible tobacco use indoors will likely exceed pre-COVID-19 rates. The Viewpoint by Qu et al., entitled “An Imperative Need for Research on the Role of Environmental Factors in Transmission of Novel Coronavirus (COVID-19)”<sup>1</sup> underscores the complexity of transmission routes of COVID-19. Of paramount concern is transmission from asymptomatic but infected caregivers via secondhand aerosol (SHA) from e-cigarettes and secondhand smoke (SHS) from combustible tobacco products to the most vulnerable groups—individuals who are older and individuals with comorbidities.<sup>2</sup> Moreover, while emerging evidence suggests younger children do not have as severe COVID-19 related health outcomes as older adults,<sup>3</sup> children are another vulnerable group that may contract the virus and subsequently become vectors of COVID-19, as they have high exposure rates to SHA and SHS.<sup>4</sup> Since older and younger populations may have limited mobility and independence, they represent a group that may involuntarily become infected by their adult caregivers who have now eschewed previously implemented smoking bans or increased their use of nicotine/tobacco products.

In homes of vapers or smokers, coronaviruses with diameters of just 0.1  $\mu\text{m}$ <sup>5</sup> may attach to larger SHA and SHS particles and droplets which have median mass aerodynamic diameters of 0.2–0.5  $\mu\text{m}$ .<sup>6</sup> Since viral-laden aerosols generated from exhalations, coughs, and sneezes can travel 23–27 feet,<sup>7</sup> aerosols and smoke generated from e-cigarettes and cigarettes may be sources of COVID-19. Given that viral loads in aerosols may survive for hours and land on surfaces on which COVID-19 remains viable for days,<sup>8</sup> SHA and SHS may increase the reach and transmission of COVID-19 in smokers’ homes to older and younger household members.

Vaping and smoking in homes may pose risks days later as well. This is because after SHA and SHS dissipates, thirdhand aerosol (THA) and thirdhand smoke (THS) settles in dust and on surfaces. Qu et al.’s viewpoint highlights airborne dust as a source to which coronaviruses can adsorb.<sup>1</sup> Dust may contain THS particles that are larger than coronaviruses (median diameter of 0.3  $\mu\text{m}$ ).<sup>9</sup> Thus, THA and THS may harbor COVID-19. There is evidence that coronaviruses can remain infectious for 9 days on inanimate surfaces<sup>10</sup> and this

may also hold true in dust. Infants and toddlers are at risk for THA and THS exposure as they are in close bodily contact with their caregivers and are actively exploring their environments. They may touch, inhale, pick up, or ingest THA or THS-infected particles, become infected, and subsequently infect older, at-risk family members.<sup>2</sup> Older adults are at risk of direct exposure from the secondhand route of inhalation and from thirdhand routes of inhalation, dermal transfer, and ingestion<sup>4</sup> from dust and objects (e.g., wheelchairs) which harbor infected fomites. Thus, there is an urgent need to avoid all indoor vaping/smoking to (1) prevent viral spread via exhaled mainstream smoke on which COVID-19 “hitches a ride” and (2) protect vulnerable nonsmokers from exposure to COVID-infected SHA/SHS and THA/THS.

E. Melinda Mahabee-Gittens

Ashley L. Merianos

Georg E. Matt  [orcid.org/0000-0001-5604-4609](https://orcid.org/0000-0001-5604-4609)

## ■ AUTHOR INFORMATION

Complete contact information is available at:  
<https://pubs.acs.org/10.1021/acs.est.0c02041>

## Funding

Funded by the National Institute of Environmental Health Studies (NIH Grant Number R01ES030743), the National Institute on Drug Abuse (NIH Grant Number K01DA044313), and California Tobacco Related Disease Research Program (TRDRP 28PT-0078).

## Notes

The authors declare no competing financial interest.

## ■ REFERENCES

- (1) Qu, G.; Li, X.; Hu, L.; Jiang, G. An Imperative Need for Research on the Role of Environmental Factors in Transmission of Novel Coronavirus (COVID-19). *Environ. Sci. Technol.* **2020**, *54*, 3730.

Received: April 1, 2020

Accepted: April 10, 2020

- (2) Zhou, F.; Yu, T.; Du, R.; et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* **2020**, 395 (10229), 1054–1062.
- (3) Cruz, A.; Zeichner, S. COVID-19 in Children: Initial Characterization of the Pediatric Disease. *Pediatrics* **2020**, e20200834.
- (4) Mahabee-Gittens, E. M.; Merianos, A. L.; Matt, G. E. Preliminary evidence that high levels of nicotine on children's hands may contribute to overall tobacco smoke exposure. *Tob Control* **2017**, 27 (2), 217–219.
- (5) Fehr, A. R.; Perlman, S. Coronaviruses: an overview of their replication and pathogenesis. *Methods Mol. Biol.* **2015**, 1282, 1–23.
- (6) Mulder, H. A.; Patterson, J. L.; Halquist, M. S.; et al. The Effect of Electronic Cigarette User Modifications and E-liquid Adulteration on the Particle Size Profile of an Aerosolized Product. *Sci. Rep.* **2019**, 9 (1), 10221.
- (7) Bourouiba, L. Turbulent Gas Clouds and Respiratory Pathogen Emissions: Potential Implications for Reducing Transmission of COVID-19. *JAMA* **2020**, DOI: 10.1001/jama.2020.4756.
- (8) van Doremalen, N.; Bushmaker, T.; Morris, D. H.; et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. *N. Engl. J. Med.* **2020**, DOI: 10.1056/NEJMc2004973.
- (9) Becquemin, M. H.; Bertholon, J. F.; Bentayeb, M.; et al. Third-hand smoking: indoor measurements of concentration and sizes of cigarette smoke particles after resuspension. *Tob Control* **2010**, 19 (4), 347–348.
- (10) Kampf, G.; Todt, D.; Pfaender, S.; Steinmann, E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *J. Hosp Infect* **2020**, 104 (3), 246–251.