

Table 1. Surface Swabs and Passive Air Samples Collected From Unoccupied, Clean Rooms (Empty Room) and After Delivery*

	Empty Room			After Delivery		
	Gene Copies/Microliter	No. Positive	Highest Gene Copies/Microliter	Gene Copies/Microliter	No. Positive	Highest Gene Copies/Microliter
Surface swabs						
Vaginal birth 1	1.23±3.92	2/11 (18)	13.0	2.11±6.99	1/11 (9)	23.2
Vaginal birth 2	0.05±0.15	1/9 (11)	0.48	4.72±7.36	6/9 (67)	10.1
Cesarean birth 1	0	0/12 (0)	NA	0	0/12 (0)	NA
Cesarean birth 2	0	0/13 (0)	NA	0.04±0.17	1/13 (8)	0.63
Total	1.28	3/45 (7) [†]		6.87	8/45 (18) [‡]	
Passive air samples (/h)						
Vaginal birth 1	0.23±0.52	1/5 (20)	1.16	0	0/5	NA
Vaginal birth 2	0	0/5 (0)	NA	1.70±2.29	4/5 (80)	5.57
Cesarean birth 1	0	0/7 (0)	NA	0	0/7 (0)	NA
Cesarean birth 2	0	0/6 (0)	NA	0.10	1/6 (17)	0.24
Total	0.23	1/23 (4)		1.80	5/23 (22)	

Data are mean±SD or n/N (%) unless otherwise specified.

NA, not applicable.

* Data for each individual birth are presented as mean gene copy concentration in recovered buffer.

[†] Location of positive surface swabs: floor (n=2), door curtain (n=1).

[‡] Location of positive surface swabs: bed stirrups (n=2), floor (n=3), door curtain (n=1), newborn isolette (n=1), keyboard (n=1).

(5/23, 21.7%) (Table 1). The greatest change from baseline was after vaginal birth 2 (negative pressure room). After vaginal birth 2, the majority of the passive air settling dishes tested positive (four of five). Three of these positive settling dishes were located more than 6 feet from the patient bed.

Postdelivery active air sampling results were not consistent by delivery type. No viral RNA was detected by active air sampling before or after cesarean birth 2, whereas it was detected after vaginal birth 2 (14.4 gene copies/L air) and cesarean birth 1 (4.80 gene copies/L air).

Postdelivery face shield sampling results also varied by delivery type. SARS-CoV-2 RNA was not detected on any face shield (surgeons, anesthesiologist, or nurses) after either cesarean birth. The health care worker personal protective equipment for vaginal birth 1 was not obtainable. All health care worker face shields were positive for SARS-CoV-2 RNA after vaginal birth 2 (Fig. 1).

DISCUSSION

We found that patients with asymptomatic SARS-CoV-2 infection give rise to SARS-CoV-2 environmental contamination during childbirth. One vaginal birth resulted in viral RNA airborne dispersion at a distance greater than 6 feet, and the care team had significant facial exposure to SARS-CoV-2. Our findings suggest that the risk of SARS-CoV-2 transmission from labor and delivery is higher than previously thought. In contrast, Ong et al⁸ found no health care worker personal protective equipment contamination among those

caring for patients with symptomatic COVID-19 not undergoing aerosol-generating procedures. Speech generates large- and small-particle aerosols. Particle emission rate increases 10-fold with loud as compared with quiet speaking.⁹ Shouting and heavy breathing during painful active labor likely generates considerable viral-laden particles. We posit that these airborne particles caused personal protective equipment contamination and also provide an explanation for our positive passive air sampling distant from the patient. We suspect that the extent of contamination varies by delivery type and other patient factors, such as mask-wearing.

Our study limitations include a small sample size and the inability to determine airborne particle size and virus viability or infectivity. It is also important to acknowledge that a small number of baseline samples detected SARS-CoV-2 RNA. No environment is sterile, and SARS-CoV-2 RNA may remain detectable in the environment for at least 17 days.¹⁰ Prior room occupants tested “nondetectable” for SARS-CoV-2, but

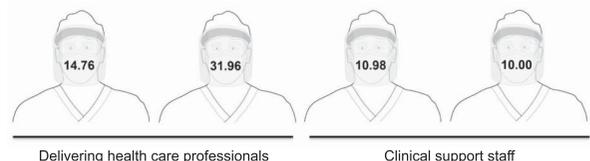


Fig. 1. Viral copy numbers per face shield swab (gene copies/microliter) from the health care team after vaginal birth 2. Illustration by Dr. Mark Fretz. Used with permission. *Hermesch. SARS-CoV-2 Environmental Contamination and Childbirth. Obstet Gynecol 2020.*

asymptomatic visitors and health care workers are not routinely tested. Our results reinforce the importance of universal masking, excellent hand hygiene, environmental cleaning, and visitor-limitation policies that minimize exposure and contamination risk.

These findings support the American College of Obstetricians and Gynecologists' personal protective equipment recommendations for obstetrician-gynecologists.¹¹ Our current practice is to use airborne isolation precautions, including N95 respirators and face shields for all deliveries of patients who test positive for SARS-CoV-2 or are of unknown status. These precautions appear particularly important given the difficulty of patient mask-wearing during active labor. Although preliminary in nature, our data demonstrate unique risk for SARS-CoV-2 exposure during labor through prolonged, close contact and a droplet- and aerosol-generating process.

As personal protective equipment is depleted,^{12,13} risk stratification of patient interactions is used to ensure availability for the highest-risk situations. To our knowledge (based on a PubMed search using the terms "aerosol-generating procedure" with "vaginal birth" or "cesarean birth" and using the timeframe "all dates"), a direct comparison between childbirth and other aerosol-generating procedures has not been done to support the current Centers for Disease Control and Prevention statement that, "Forceful exhalation during the second stage of labor is not considered an aerosol-generating procedure for respirator prioritization during shortages over procedures more likely to generate higher concentrations of infectious respiratory aerosols."¹⁴ This lack of data highlights the critical need to further evaluate interventions that mitigate health care worker risk while caring for patients during birth, the most frequent hospitalization encounter in the United States.

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