

OBSERVATION: BRIEF RESEARCH REPORT

Environment and Personal Protective Equipment Tests for SARS-CoV-2 in the Isolation Room of an Infant With Infection

Background: Severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2) is suspected to be spread from an infected person to a susceptible host primarily via droplet and possibly direct contact (1). The roles of transmission by indirect contact (fomites) or by long-range airborne route are uncertain. Currently, there are no data on the risk for transmission from infants or young children with coronavirus disease 2019 (COVID-19) who may be asymptomatic or pauci-symptomatic.

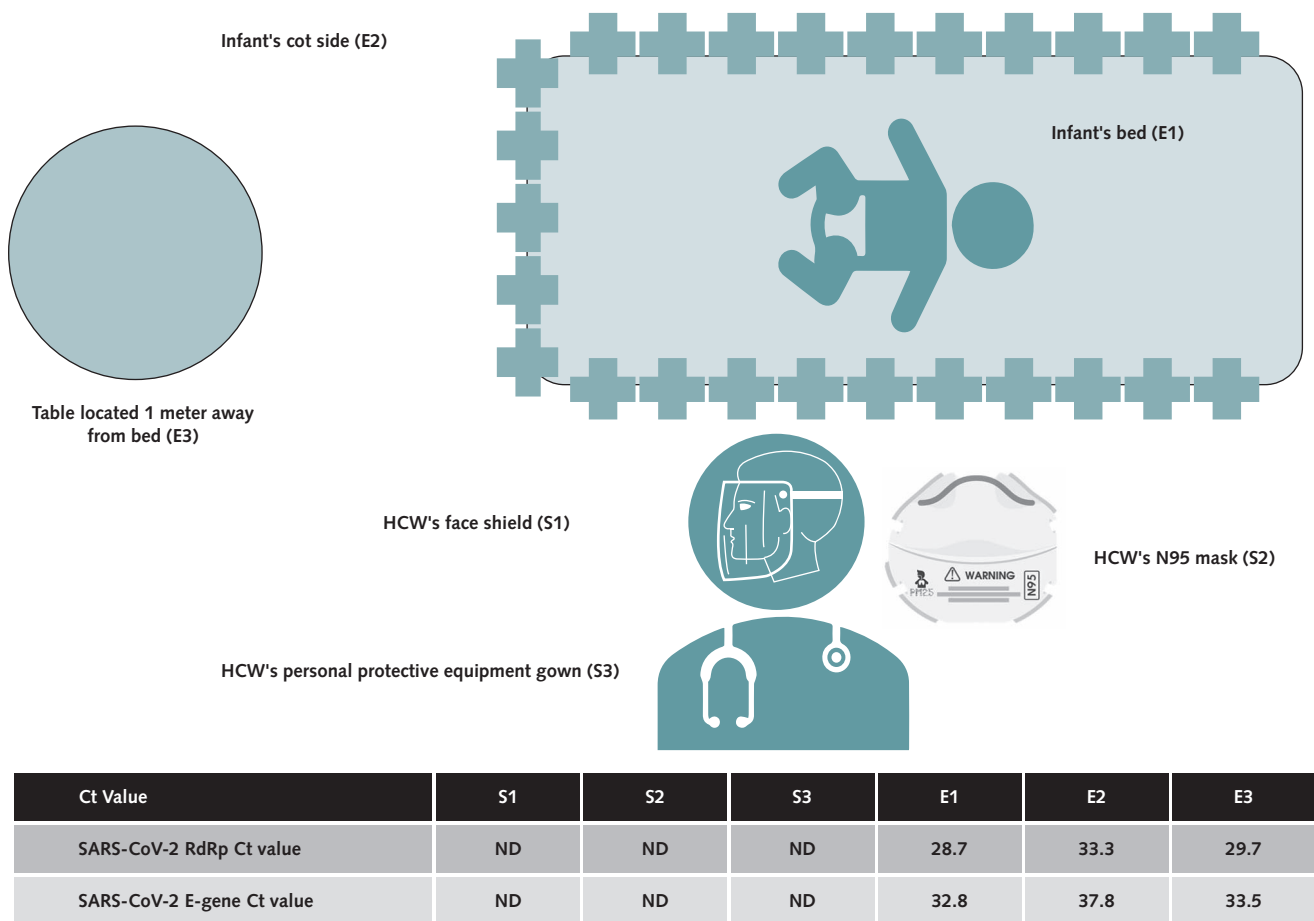
A 6-month-old infant was admitted for isolation in our hospital because both parents were in the isolation units of other hospitals for confirmed COVID-19. On admission, the infant was asymptomatic, but nasopharyngeal swabs confirmed COVID-19 infection with very high viral load. The cycle threshold (Ct) values for *N* gene and *Orf1ab* gene polymerase chain reaction (PCR) assay were 15.6 and 13.7, respectively,

on the day of admission (2). The infant was generally well throughout admission, with only a single measured temperature of 38.5 °C on day 2 of admission. There were no respiratory symptoms, results of physical examination were normal, and no other abnormal vital signs were noted throughout the infant's stay.

Objective: To investigate environmental contamination and potential for transmission from an infant with COVID-19.

Methods and Findings: On day 2 of admission, we sampled the infant's isolation environment and the personal protective equipment (PPE) of a health care worker (HCW) who was looking after the infant. On that day, the Ct values on real-time PCR for the *N* gene and *Orf1ab* gene were 18.8 and 18.6, respectively, while urine and stool samples remained negative (2). No one apart from HCWs with full PPE had contact with the infant during the admission. Synthetic fiber flocked swabs with Universal Transport Medium were used to sample the infant's bedding; the cot rail; a table situated 1 meter away from the infant's bed; and the HCW's face shield, N95 mask, and waterproof gown (6 swabs in total) (Figure).

Figure. Layout of environmental sampling and results.



E = environment sample; Ct = cycle threshold; HCW = health care worker; ND = not detectable; S = swab; SARS-CoV-2 = severe acute respiratory syndrome-coronavirus 2.

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Each swab was run over nearly 100% of the item or area. The PPE of the HCW was sampled after the HCW carried and fed the infant. Total time spent in the room was about 15 minutes. The environmental samples were tested with PCR, using a published protocol (3) for the *E* and *RdRp* genes. Ct values less than 36 were considered positive. Lower Ct values represent higher viral load, and vice versa.

The infant's bedding, the cot rail, and a table situated 1 meter away (all 3 environment samples) were found to be positive for SARS-CoV-2. The SARS-CoV-2 *RdRp* gene Ct values for the bedding, cot, and table were 28.7, 33.3, and 29.7, respectively. Similar SARS-CoV-2 *E* gene Ct trend values were detected from the environment in terms of distance from the infant (Figure). All 3 samples from the HCW's PPE were found to be negative for SARS-CoV-2.

Discussion: Our investigation confirmed that a generally well infant with COVID-19 can contaminate the environment with PCR-detectable virus. Although we cannot be certain of virus viability, other coronaviruses have been reported to remain viable on surfaces for up to 9 days (4). Despite close physical contact with the infant during feeding, we did not detect any evidence of SARS-CoV-2 on the gown of the HCW.

A study of mobile adults with COVID-19 who had symptoms found widespread environmental contamination but negative PPE swabs (5). Although our infant had no respiratory symptoms, the nearby environment could have been contaminated with SARS-CoV-2 through crying or drooling. There was a downward trend of viral load with increasing distance from the infant (from bedding to cot rail). However, the Ct values at the table 1 meter away from the cot indicated higher viral load. For droplet transmission, one would expect the viral load in the environment to fall with increasing distance from the immobile infant. However, baby formula and other items, such as baby wipes, were placed on it. Therefore, it seems more likely that the contamination was due to indirect contact via HCW hands between baby and table. These findings suggest that even generally well infants positive for SARS-CoV-2 with no respiratory symptoms can easily contaminate nearby environments. Our data also reaffirm the importance of hand hygiene when caring for infants with COVID-19 and potentially in helping to reduce environmental virus contamination.

Chee Fu Yung, MBChB

Infectious Disease Service, KK Women's and Children's Hospital
Duke-NUS Medical School
and Lee Kong Chian School of Medicine, Nanyang Technological University
Singapore

Kai-qian Kam, MBBS

Infectious Disease Service, KK Women's and Children's Hospital
Singapore

Michelle S.Y. Wong, PhD

Verification and Attribution Laboratory, DSO National Laboratories
Singapore

Matthias Maiwald, MD

KK Women's and Children's Hospital
Singapore

Yian Kim Tan, PhD

Verification and Attribution Laboratory, DSO National Laboratories
Singapore

*Boon Huan Tan, PhD**

Biological Defence Programme, DSO National Laboratories
Singapore

*Koh Cheng Thoon, MBBS**

Infectious Disease Service, KK Women's and Children's Hospital, Singapore

Note: Authors indicated with an asterisk (Drs. Tan and Thoon) contributed equally to this article.

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