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Detection of SARS-CoV-2 in human breastmilk

It remains unclear whether severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can be shed into breastmilk and transmitted to a child through breastfeeding. Recent investigations have found no evidence of SARS-CoV-2 in human breastmilk, but sample sizes were small.1–3 We examined milk from two nursing mothers infected with SARS-CoV-2. Both mothers were informed about the study and gave informed consent. Ethical approval for this case study was waived by the Ethics Committee of Ulm University and all samples were anonymised.

Clinical data and the timecourse of infection in the two mothers is shown in figure 1. After feeding and nipple disinfection, milk was collected with pumps and stored in sterile containers at 4°C or –20°C until further analysis. We determined viral loads using RT-qPCR for SARS-CoV-2 N and ORF1b-nsp14 genes4 in both whole and skimmed milk (obtained after removal of the lipid fraction). Further details of sample storage and processing are provided in the appendix. Following admission and delivery (day 0), four samples from Mother 1 tested negative (figure 2). By contrast, SARS-CoV-2 RNA was detected in milk from Mother 2 at days 10 (left and right breast), 12, and 13. Samples taken subsequently were negative (figure 2). Ct values for SARS-CoV-2 N peaked at 29.8 and 30.4 in whole milk and skimmed milk, respectively, corresponding to 3.32 × 10^5 copies per mL and 9.48 × 10^4 copies per mL (mean of both isolations). Since milk components might affect RNA isolation and quantification, viral RNA recovery rates in milk spiked with serial dilutions of a SARS-CoV-2 stock were determined. We observed up to 89.2% reduced recovery rate in whole milk and 51.5% in skimmed milk (appendix), suggesting that the actual viral loads in whole milk of Mother 2 could be even higher than detected.

We detected SARS-CoV-2 RNA in milk samples from Mother 2 for 4 consecutive days. Detection of viral RNA in milk from Mother 2 coincided with mild COVID-19 symptoms and a SARS-CoV-2 positive diagnostic test of the newborn (Newborn 2). Mother 2 had been wearing a surgical mask since the onset of symptoms and followed safety precautions when handling or feeding the neonate (including proper hand and breast disinfection, strict washing, and nipple disinfection, milk was collected with pumps and stored in sterile containers at 4°C or –20°C until further analysis. We determined viral loads using RT-qPCR for SARS-CoV-2 N and ORF1b-nsp14 genes4 in both whole and skimmed milk (obtained after removal of the lipid fraction). Further details of sample storage and processing are provided in the appendix. Following admission and delivery (day 0), four samples from Mother 1 tested negative (figure 2). By contrast, SARS-CoV-2 RNA was detected in milk from Mother 2 at days 10 (left and right breast), 12, and 13. Samples taken subsequently were negative (figure 2). Ct values for SARS-CoV-2 N peaked at 29.8 and 30.4 in whole milk and skimmed milk, respectively, corresponding to 3.32 × 10^5 copies per mL and 9.48 × 10^4 copies per mL (mean of both isolations). Since milk components might affect RNA isolation and quantification, viral RNA recovery rates in milk spiked with serial dilutions of a SARS-CoV-2 stock were determined. We observed up to 89.2% reduced recovery rate in whole milk and 51.5% in skimmed milk (appendix), suggesting that the actual viral loads in whole milk of Mother 2 could be even higher than detected.

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Figure 2: Detection of SARS-CoV-2 in breastmilk from an infected mother
SARS-CoV-2 RNA was isolated from whole and skimmed breastmilk obtained at different timepoints and analysed by RT-qPCR, using primer sets targeting SARS-CoV-2 N and ORF1b genes. Samples and viral RNA standard were run in duplicates, and isolation and RT-qPCR were repeated in two independent assays. RNA in breastmilk from Mother 2 on day 25 was only isolated once and only analysed by RT-qPCR for SARS-CoV-2 N. Symbols at baseline indicate no amplification (or Ct >36.5 and no amplification in one replicate). Blue dashed line denotes quantification threshold for N (160 copies per reaction; Ct 34.2) and red dotted line for ORF1b (32 copies per reaction; Ct 35.9). Values below these lines but above baseline indicate amplification in both replicates, but no reliable quantification. Values shown represent mean (SD) from duplicates. SARS-CoV-2>severe acute respiratory syndrome coronavirus 2. Ct=cycle threshold.

and sterilisation of milk pumps and tubes). However, whether newborn 2 was infected by breastfeeding or other modes of transmission remains unclear. Further studies of milk samples from lactating women and possible virus transmission via breastfeeding are needed to develop recommendations on whether mothers with COVID-19 should breastfeed.

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COVID-19-associated hyperviscosity: a link between inflammation and thrombophilia?

Reports of thrombotic complications in patients with COVID-19 are increasingly prominent, and these reports include patients receiving therapeutic anticoagulation. At our institution, multiple occurrences of anticoagulation failure prompted us to search for alternative aetiologies contributing to refractory hypercoagulability. Here we describe COVID-19-associated hyperviscosity, a potentially severe consequence of infection with severe acute respiratory syndrome coronavirus 2, in 15 patients tested to date. This work was done ethically in accordance with institutional review board approval.

All patients were critically ill with COVID-19 pneumonia and admitted to the medical intensive care unit. 14 patients had acute respiratory distress syndrome requiring intubation, 14 patients were encephalopathic, 12 patients had shock requiring vasopressors, and 11 patients had renal failure requiring continuous renal replacement therapy (CRRT). All patients received anticoagulation according to an institutional protocol based on...