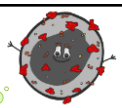
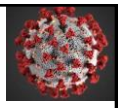
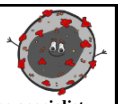



The COVID-19 Pandemic: Infant Outcomes and Feeding in this Emergency

Kathleen A. Marinelli MD, IBCLC, FABM, FAAP
Clinical Professor of Pediatrics, University of Connecticut School of Medicine
Division of Neonatology, Connecticut Children's Medical Center, Hartford, CT, USA

1

Speaker Disclosure



I am a neonatologist, and a breastfeeding medicine specialist;

I volunteer for Baby-Friendly USA;

I volunteered for many years as a medical director of a HMBANA milk bank.

I volunteer for the Academy of Breastfeeding Medicine.

I am an Associate Editor of the *Journal of Human Lactation*.

I have no associations with commercial entities.

I abide by the International Code of Marketing of Breast-Milk Substitutes.

I am a firm believer that human milk is the optimal feeding for all human babies and young children, with very few exceptions.

Kathleen A. Marinelli MD, IBCLC, FABM, FAAP

2

The participant will be able to

- Describe coronaviruses known to infect humans particularly SARS-CoV-2.
- Assess the current and on-going evidence for vertical transmission and presence of virus in human milk.
- Discuss available information concerning incidence and severity of infant COVID-19 infections.
- Evaluate the guidelines issued for postpartum care and infant feeding based on evidence, knowledge of standard infant feeding recommendations, or fear of unknown.

3

Coronavirus species

- Six coronavirus species were known to cause human Disease
  - four (229E, OC43, NL63, and HKU1
    - typically cause cold symptoms
    - immunocompetent subjects
  - two (Severe acute respiratory syndrome coronavirus [SARS-CoV] and Middle East respiratory syndrome coronavirus [MERS-CoV])
    - zoonotic in origin
    - cause severe respiratory disease outbreaks from cross-species infections

4

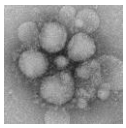
SARS-associated coronavirus (SARS-CoV)

- Severe acute respiratory syndrome (SARS)
  - First reported in Asia February 2003
  - Spread to more than two dozen countries in North America, South America, Europe, and Asia before contained
  - Viral respiratory illness
  - Infected 8098 people with a case-fatality rate of about 10.5%
  - Since 2004, there have not been any known cases of SARS reported anywhere in the world

https://www.cdc.gov/sars/index.html

5

Middle East Respiratory Syndrome Coronavirus (MERS-CoV)

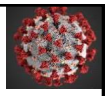


- Middle East Respiratory Syndrome (MERS)
  - First reported in Saudi Arabia September 2012
  - First known cases in Jordan April 2012
  - Largest outbreak outside Arabian Peninsula in Republic of Korea 2015
  - "Camel flu"
  - Severe respiratory illness
  - 2519 laboratory-confirmed cases; a case–fatality rate of 34.4%

https://www.cdc.gov/coronavirus/mers/about/index.html

6

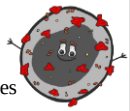
Severe Acute Respiratory Syndrome Coronavirus 2



- 31 December 2019 first case SARS-CoV-2 reported to Chinese CDC
- Late December Wuhan, Hubei Province, China, clusters of patients with pneumonia of unknown cause linked to seafood and animal wholesale market
- 3 January 2020, 44 cases reported in China
- 7 January Chinese authorities isolated a novel coronavirus
- 12 January shared genetic sequence
- Identified in Thailand January 13; Japan January 15; Korea January 20
  - Deaths already reported in China

7

Severe Acute Respiratory Syndrome Coronavirus 2



- 21 January first case in the United States
  - U.S. citizen who had been in Wuhan
- 24 January human to human transmission suggested
- 25 January spread to Australia and France
- 27 January confirmed in 11 countries outside of China
- 30 January WHO announced COVID-19 outbreak was a Public Health Emergency of International Concern
- 31 January first two cases reported in Italy
- 11 March WHO characterized COVID-19 as a pandemic
  - Acknowledging the disease's geographical spread

8

Epidemic…

…an outbreak of an infectious disease that spreads quickly affecting or tending to affect a disproportionately large number of individuals within a population, community, or region at the same time.

An example: *COVID-19 when it was contained in China.*

9

Pandemic…

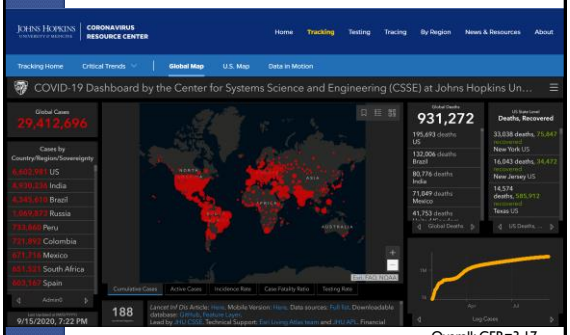
https://coronavirus.jhu.edu/map.html
September 15, 2020

… occurs when a new infectious disease, to which immunity has not developed, spreads in a widespread manner across a substantial part of the world causing significant economic, social, and political disruption.

Plotkowski M.J. (2020)

10

15 September 2020



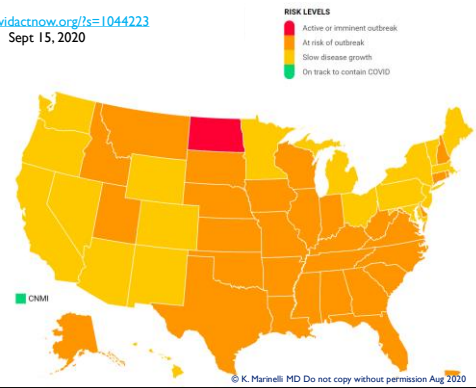
https://coronavirus.jhu.edu/map.html

Overall: CFR=3.17
US: CFR=2.96

11

America's COVID Warning System

https://covidactnow.org/?s=1044223
Sept 15, 2020



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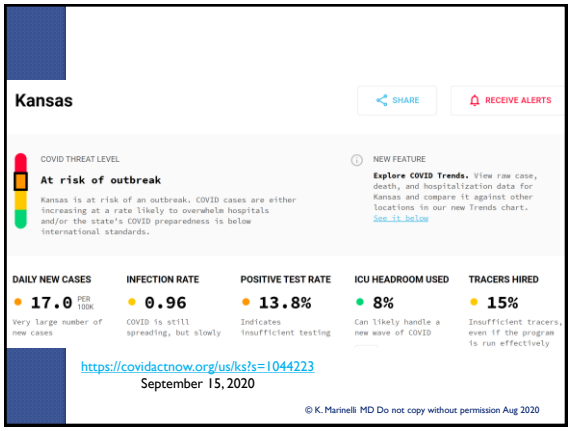
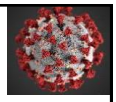


https://covidactnow.org/us/ks?s=1044223
September 15, 2020

13

Terminology



- Novel coronavirus, SARS-CoV-2 is Severe Acute Respiratory Syndrome Coronavirus 2: the *virus*
- COVID-19 is Coronavirus Disease 2019: the *disease* caused by the virus
- Reverse Transcription Polymerase Chain Reaction (RT-PCR): the gold standard *test* to confirm diagnosis
- PPE is personal protective equipment
- IPC is infection protection and control

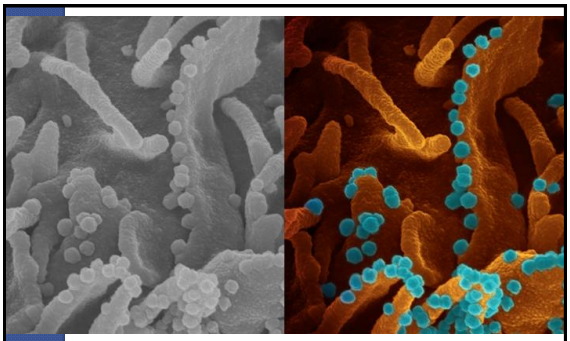
14

SARS-CoV-2

- single-stranded RNA virus, genus betacoronavirus
- 88–96% sequence identity to three bat-derived SARS-like coronaviruses
- and a coronavirus strain isolated in pangolins
  - scaly, ant-eating mammal
  - highly trafficked for its presumed medicinal virtues
  - clandestinely sold in live animal markets such as Wuhan

https://www.worldwildlife.org/species/pangolin

15



Elizabeth Fischer, Rocky Mountain Laboratories, National Institute of Allergy and Infectious Diseases, Hamilton, MT. A snapshot of viral shedding, a process in which viral particles are released from a dying cell (commonly studied primate kidney epithelial cell line). https://directorsblog.nih.gov/2020/04/28/capturing-viral-shedding-in-action/

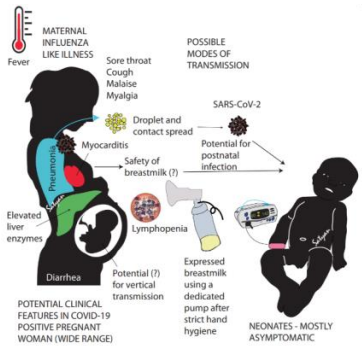
16

A word of caution…

- Enormous need for information to inform clinical care, policy making, and planning
- Articles are being released at a rapid rate
  - in pre-print, pre-peer review formats
- Peer review process is critical
- Critically read these reports
  - particularly methodology
  - don't take at face value

17

Vertical transmission



Mimouni, F et al., 2020

18

Evidence: Maternal outcomes

- Scoping review 33 original studies reporting 385 women with COVID-19 during pregnancy and childbirth
- 10 countries
- December 8, 2019 to April 19, 2020
- 175 (69.4%) delivered by cesarean 77 (30.6%) vaginal birth
- Case severity 368 mild (95.6%); 4 severe (3.6%); 3 critical (0.8%)
- 17 (4.4%) required ICU admission
- 6 (1.6%) mechanically ventilated (1ECMO)
- All ICU admissions improved and discharged, except for one mortality and one case on ECMO

Elshafeey et al., 2020

March 2020 Anthony Wallace_AFP via Getty Images

19

Rates of Maternal and Perinatal Mortality and Vertical Transmission in Pregnancies Complicated by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Co-V-2) Infection: A Systematic Review

- **13 studies included 538 pregnancies**
  - **SARS-CoV-2 diagnosed by RT-PCR NP swab specimen**
  - **420 from China, 76 from the United States, 42 from Italy**
  - **20.1% rate of preterm birth**
  - **85% underwent cesarean delivery (306/332 from China, 18/332 from Italy, 8/332 from US)**

Huntley et al., 2020

20

Rates of Maternal and Perinatal Mortality and Vertical Transmission in Pregnancies… (cont)

- **3.0% (8/263) maternal ICU admission rate**
- **No maternal deaths secondary to COVID-19**
- **NICU admission rate influenced by Chinese reports**
  - **134/137 newborns admitted to the NICU in Chinese reports**
  - **3/137 from United States**
  - **64.9% overall NICU admission (protocol in China)**
    - **rate of 5-minute Apgar scores less than 7 was 0.5%.**
    - **neonatal mortality occurred in 0.3% of cases**
    - **no cases of vertical transmission**

Huntley et al., 2020

21

Neonatal management and outcomes during the COVID-19 pandemic: An observation cohort study

- **116 SARS-COV-2 positive mothers; 3 hospitals in NY City**
  - **rooming-in and breastfeeding with IPC measures****
  - **82 neonates followed up at 5-7 days rooming-in (83%); breastfeeding(78%) rates**
  - **No positive SARS-COV-2 among the 79 neonates retested at 5-7 and 14 days old**

Salvatore et al., 2020

22

Evidence: Newborn COVID-19 outcomes

- **Critical systematic review**
- **49 studies**
  - ***n*=666 neonates of *n*=655 women**
    - **testing COVID-positive or "high clinical suspicion" through May 2020**
  - **28 (4%) infants had confirmed COVID-19**
  - **more after cesarean delivery (*n*=20; 5.3%) than vaginal (*n*=8; 2.7%)**
  - **no association of infection with feeding method or maternal proximity**

Walker et al., 2020

23

Evidence: Newborn COVID-19 outcomes

- **28 cases of "vertical transmission" were reported but none fulfilled confirming criteria**
- **Authors summarize: "neonatal COVID-19 infection is uncommon, almost never symptomatic, and the rate of infection is no greater when the baby is born vaginally, breastfed or allowed contact with the mother"**

Walker et al., 2020

24

25

Evidence: Newborn outcomes

- 33 studies from 10 countries
- 248 singleton & 4 twin pregnancies
- 30–41 weeks of gestation
- 39 (15.2%) preterm birth (<37 weeks)
- 8 NICU (3.1%)
  - 3 (1.2%) mechanical ventilation; 3 (1.2%) pneumonia
  - 12 (4.7%) respiratory distress syndrome
- Much of the prematurity may have been iatrogenic
  - cesarean rates 92.2% in review of 16 studies (Teles Abrao Trad et al., 2020)

Elshafeey et al., 2020

26

Infants

- **The World Health Organization defines an infant as "a child younger than one year of age" (WHO, 2013)**
- **COVID-19 appears to be less prevalent and generally less severe in infants and young children than in older populations**
  - **However, there are exceptions**

27

US Centers for Disease Control and Prevention (CDC COVID-19 Response Team, 2020)

- 149,082 lab-confirmed COVID-19 cases in US which age known from Feb 12-April 2, 2020
  - 2,572 (1.7%) cases in children <18 years
  - 398 (15%) infants <1 year
  - 95 children <1 year with known hospitalization status
    - 59 (62%) hospitalized
    - 5 admitted to an ICU
  - infants <1 year are underrepresented as COVID patients
  - findings are comparable to findings in China

28

Pre-publication Release

Epidemiological Characteristics of 2143 Pediatric Patients With 2019 Coronavirus Disease in China

Yuanyuan Dong, Xi Mo, Yabin Hu, Xin Qi, Fang Jiang, Zhongyi Jiang, Shilu Tong

Epub 2020 Mar 16

DOI: 10.1542/peds.2020-0702
Journal: *Pediatrics*
Citation: Dong Y, Mo X, Hu Y, et al. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. *Pediatrics*. 2020; doi: 10.1542/peds.2020-0702

PEDIATRICS

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Article

Epidemiology of COVID-19 Among Children in China

Yuanyuan Dong, Xi Mo, Yabin Hu, Xin Qi, Fan Jiang, Zhongyi Jiang and Shilu Tong

Pediatrics June 2020, 145 (6) e20200702; DOI: https://doi.org/10.1542/peds.2020-0702

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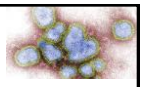
Epidemiology of COVID-19 Among Children in China (Dong, Y., et al, 2020)

- Chinese CDC, 16 Jan - 8 Feb 2020
  - 2143 pediatric patients, 379(376) <1 year old
  - counted both "confirmed" (*n*=85) by testing and "suspected" (*n*=291) *by* symptoms as COVID-19 cases
  - Of 40 infants in the severe and critical categories, only 17.5% (*n*=7) were confirmed
  - Problems: non-specific symptoms c/w respiratory and gastrointestinal pathogens
  - Children with coronavirus in their respiratory tracts can have viral co-infections in up to 2/3 of cases (Heimdal, 2020)

30

Common viral pathogens



- January 7 to January 15, 2020, 366 hospitalized children (≤16 years of age) enrolled in a retrospective study of respiratory infections
- most frequently detected were influenza A virus (n=23; 6.3%) and influenza B virus (n=20; 5.5%)
- Covid-19 detected in 6 patients (1.6%)
- severe cases in the "suspected" category in Dong Y., et al. could have been due to other, more prevalent, respiratory viruses

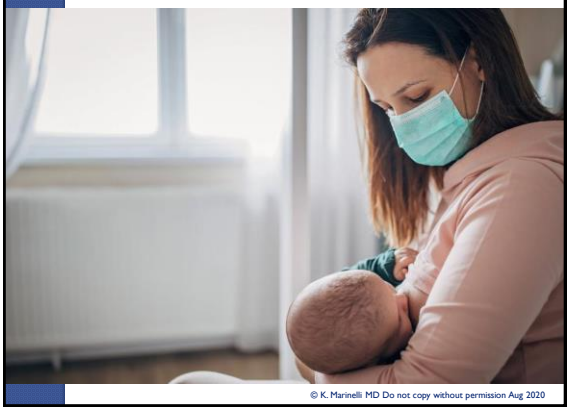
Liu et al, 2020

31

Summary: Infant COVID-19

- Presenting as "fever of unknown origin" in infants
- Appears to occur from horizontal transmission
- Generally mild or asymptomatic compared to older age groups
  - Serious cases do occur
    - 1.8% <16 yo admitted to ICU (Lu et al., 2020)
    - 5 < 1 yo of 15 pediatric ICU admissions in CDC data (33.3%) (CDC COVID-19 Response Team, 2020)
      - 3 pediatric deaths under investigation
    - 34+5/7 death due to multiple organ failure (Zhu et al., 2020)
    - stillbirth (Liu et al., 2020)
- Jury still out on placental transmission

32



33

SARS-CoV-2 and human milk: What is the evidence? Lackey, K. A. et al., 2020

- **14 studies tested human milk for human coronaviruses**
  - **48 milk samples from 32 women**
  - **all but one tested negative for SARS-CoV-2**
    - **reported in a non-peer-reviewed, preprint**
    - **no methodologies provided**
      - **any interpretation of results must be made with extreme caution**

34

Evaluation of SARS-CoV-2 in Breastmilk from 18 Infected Women

- **64 serial milk samples from 18 SARS-CoV-2-infected U.S. women collected before and after positive SARS-CoV-2 RT-PCR tests**
  - **one with SARS-CoV-2 RNA by RT-PCR**
- **subset of 26 milk samples from nine women tested for replication-competent virus by established culture methods**
  - **All were negative including the sample that tested positive for viral RNA**
- **While determining presence of viral RNA in mothers' milk is important, more research with validated methods of analysis for the human milk matrix and culture for viability of virus are required**

Chambers et al., *JAMA*. 2020;e2015580

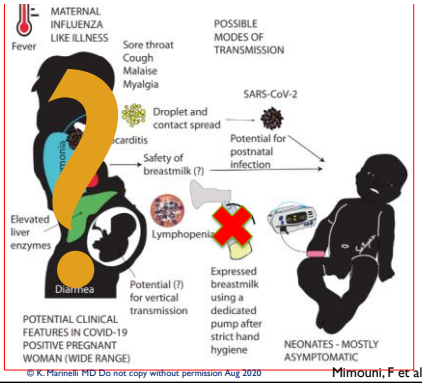
35

COVID-specific immunoglobulins in human milk

- **COVID-positive mother's milk in the newborn period was negative for virus but positive for SARS-Co-V specific IgG and IgA (Dong, Chi et al., 2020)**
- **Mother with COVID symptoms, who roomed-in and exclusively breastfed her infant had SARS-CoV-2 specific IgA in her milk on day three of life. Her infant remained well through 45 days of follow-up (Lebrão et al., 2020)**

36

Have we dismissed vertical transmission?



Mimouni, F et al., 2020

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Let's stop and think…

What is being done globally, and on what basis, to laboring women and postpartum mothers and infants in the era of COVID-19?

38

WHAT WE KNOW

Think about this…guidance…

- Largest published experience of coronavirus in pregnancy and delivery is from China
- Almost exclusively caesarean deliveries: Chinese expert consensus on the perinatal and neonatal management for the prevention and control of the 2019 novel coronavirus infection (6 Feb 2020)
- Separated from their infants for a minimum of 14 days and not breastfed or roomed in

39



Wuhan, China

40

An Indonesian nurse wearing protective gear holds a newborn baby wearing a face shield at a clinic in Bireuen. Photograph: Amanda Jufrian/AFP via Getty Images

41

Wuhan, March 2020

Wang Xueli is a midwife at the Shijiazhuang Fourth Hospital of Hebei Province

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US CENTERS FOR DISEASE CONTROL AND PROTECTION

February 2020

- **Consider temporarily separating (e.g., separate rooms) the mother who has confirmed COVID-19 or is a PUI from her baby**
- **If rooming in with her newborn, consider using physical barriers (e.g. a curtain between the mother and newborn) and keeping the newborn ≥6 feet (2 m) away from mother**
- **During temporary separation, mothers who intend to breastfeed should be encouraged to express their milk**
- **If a mother and newborn do room-in and the mother breastfeeds, she should wear a facemask and practice hand hygiene before each feeding**

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WORLD HEALTH ORGANIZATION

13 March 2020

- Infants born to mothers with suspected/probable/ confirmed COVID-19 should be fed according to standard infant feeding guidelines, applying necessary Infection Prevention and Control (IPC)
  - Initiate within 1 hour; exclusivity
- Breastfeeding, skin-to-skin or kangaroo mother care: practice respiratory/hand hygiene before/after contact with child; routinely clean/disinfect surfaces symptomatic mother has contacted
- Provide breastfeeding counselling, basic psychosocial support, and practical feeding support to all pregnant women and mothers

https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected

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WORLD HEALTH ORGANIZATION

28 April 2020

- If unable to breastfeed encourage and support mothers to express their milk, and safely provide their milk to the infant
- Remain together and practice rooming-in throughout the day and night
- FAQs include donor milk, wet-nursing, relactation options

https://www.who.int/docs/default-source/maternal-health/faqs-breastfeeding-and-covid-19.pdf?sfvrsn=d839e6c0_1
https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected

45

International Perspectives Concerning Donor Milk Banking in the SARS-CoV-2 (COVID-19) Pandemic (Marinelli, KA, March 30, 2020)

- personal communications with colleagues in China, Italy, and my own donor milk bank in Illinois, United States
  - Professor Liu (China): both supply and demand of donor milk in China has decreased significantly
  - donor screening "more careful and rigorous"
  - all milk is expressed in person
    - in hospital to donate, all milk from home is refused
    - containers always supplied by the milk banks

https://journals.sagepub.com/doi/full/10.1177/0890334420917661

46

International Perspectives Concerning Donor Milk Banking in the SARS-CoV-2 (COVID-19) Pandemic (Marinelli, KA, March 30, 2020)

- Drs. Enrico Bertino and Guido Moro (Italy): "…all the activities of our country are completely blocked."
  - Donation of human milk has decreased a lot
  - Mothers…prefer to stay as far as possible from hospitals…
  - system of home milk collection…has been stopped
- donation of human milk in Milan has been practically suspended

https://journals.sagepub.com/doi/full/10.1177/0890334420917661

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Milk Banking Associations: EMBA

- Added screening questions for travel, COVID-19 exposures
- Temporarily suspending recruitment of new donors possibly exposed for 2 weeks
- Not accepting donations from current donors who may have been exposed for 2 weeks
- An established donor who develops symptoms should suspend donation and be tested.
  - If the culture is positive for SARS CoV-2, donation should be interrupted until a negative culture is found
  - If the culture is negative for SARS CoV-2, donation can be continued

https://europeanmilkbanking.com/covid-19-emba-position-statement/ 25 Feb 2020

48

Safe Handling of Containers of Expressed Human Milk in all Settings During the SARS-CoV-2 (COVID-19) Pandemic (Marinelli & Lawrence, 2020)

- Received questions from NICUs globally and non-US health authority on how to handle containers of expressed milk
- Glass contamination appeared in the range of 4–5 days, while plastics were from 48 hr to 9 days (Kampf et al. 2020; van Doremalen et al. 2020)
- Many surfaces positive in the room of patient tested prior to disinfection.
  - No surfaces were positive in the rooms of patients after disinfection (Ong et al., 2020)

https://journals.sagepub.com/doi/pdf/10.1177/0890334420919083 3 April 2020

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Table 1. Recommendations for Handling Containers of Human Milk After Milk is Expressed.

Recommendations
• Receive containers from mothers or boxes of donor milk with gloved hands
• Wipe down the outside surface of the individual milk containers with disinfectant
◦ suggest viricidal agents already in place at hospitals, donor milk banks, etc.
◦ alternatively use "high level disinfection" of 0.5% solution, a dilution of 1:10 diluted bleach (sodium hypochlorite [NaOCl])
• Set wiped containers in a rack or on a tray to dry (wet to dry ensures time for viricidal effect) before storing in refrigerators or freezers
• For hospital wards and neonatal intensive care units, separate bins for each infant in the same refrigerator are fine once the containers have been wiped down
• Resume usual protocol

Note. Adapted from Centers for Disease Control and Prevention (2020); Kampf et al. (2020); Ong et al. (2020); van Doremalen et al. (2020); and

https://journals.sagepub.com/doi/pdf/10.1177/0890334420919083 3 April 2020

Response to Letters to the Editor about the Safe Handling of Containers of Expressed Human Milk in all Settings During the SARS-CoV-2 (COVID-19) Pandemic

https://journals.sagepub.com/doi/full/10.1177/0890334420924351

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Delivery in NYC hospital

First delivery of a COVID mom in Michigan, US

52

Graphic by Marco Davanzo Clinica Mangiagalli, Milan March 2020

53

What do we lose when fear, not evidence guides practice?

54

Insights into Practice and Policy

Implications of the COVID-19 Pandemic Response for Breastfeeding, Maternal Caregiving Capacity and Infant Mental Health

Aug. 6, 2020

https://journals.sagepub.com/doi/pdf/10.1177/0890334420949514

Karleen Gribble, PhD, BrurSc[1*], Kathleen A. Marinelli, MD, IBCLC, FABM, FAAP[2*], Cecilia Tomori, PhD, MA[3], and Marielle S. Gross, MD, MBE[4]

Keywords

attachment, breastfeeding, child neglect, COVID-19, infant and young child feeding in emergencies, infant mental health, maternal proximity, maternal caregiving capacity, milk expression, pandemic, rooming-in, SARS-CoV-2, skin-to-skin contact, vertical transmission

Background

The COVID-19 pandemic is an emergency the magnitude of which has not been encountered for a century. The World Health Organization (WHO) classified the spread of the novel coronavirus, SARS-CoV-2, as a pandemic on March 11, 2020. It constitutes an emergency because of the widespread morbidity and mortality associated with COVID-19 (the disease caused by the virus) and its accompanying economic and social impact (United Nations Office for Disaster Risk Reduction, 2016). Emergencies are recognized in the United Nations Children's Fund (UNICEF)/WHO *Global Strategy on Infant and Young Child Feeding* as one of the "exceptionally difficult circumstances" (UNICEF & WHO, 2003, p. 11) where special attention should be given to support...

in this review is old, because the findings are so well established that there is no need for repetition, and it would now be unethical to expose infants to the harms of depriving them of skin-to-skin, maternal proximity, and breastfeeding for research purposes.

Current State of the Science About Human Milk and COVID-19

Protective Influences of Breastfeeding on Infant Physical Health During the COVID-19 Pandemic

International recommendations are that infants initiate breastfeeding within an hour of birth, breastfeed exclusively until 6 months, and continue to breastfeed, with the addition...

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COVID-19 pandemic is an IYCF Emergency!

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We haven't even touched on areas already in emergency mode; disparities; refugees, on-going disasters; poorly resourced regions; and more, with COVID on top.

The COVID Pandemic IS an IYCF Emergency. It must be recognized as one, and we must never again be blindsided like this. Our children, our future, depend on us to act now, cooperatively, as a global voice.

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Postscript…

- **CDC update 8/3/2020**
  - immediate skin-to-skin care
  - SARS-CoV-2 infections in neonates uncommon
  - mothers with suspected or confirmed SARS-CoV-2 infection and their neonates isolated together (https://www.cdc.gov/coronavirus/2019-ncov/hcp/caring-for-newborns.html)
- **AAP update 7/22/2020**
  - Mothers and newborns may room-in
  - mother should maintain a reasonable distance from her infant when possible
  - Mothers should perform hand hygiene before breastfeeding and wear a mask during breastfeeding (https://services.aap.org/en/pages/2019-novel-coronavirus-covid-19-infections/clinical-guidance/faqs-management-of-infants-born-to-covid-19-mothers/)

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Thank you
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