

# Breastfeeding, Human Milk Collection and Containers, and Human Milk Banking: Hot Topics During the COVID-19 Pandemic

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Guido E. Moro, MD<sup>1</sup>  and Enrico Bertino, MD<sup>2</sup>

## Keywords

breastfeeding, breast pump, human milk expression, human milk, milk banking

Coronavirus Disease 2019 (COVID-19) is a severe and rapidly spreading viral disease that was declared a pandemic by the World Health Organization (WHO, 2020a) on March 11, 2020. This rapidly evolving disease has highly affected the care of newborns delivered by women with suspected or confirmed COVID-19 infection. The main issues of concern are (1) breastfeeding during the pandemic; (2) human milk collection and the handling of containers when the dyad (mother–infant) is separated, with mothers expressing their milk; and (3) making donations of human milk to human milk banks. An overview of different strategies with their practical implications is presented.

## Breastfeeding during the Pandemic

Concerning breastfeeding, different approaches have been suggested, with the large majority of scientific committees and associations recommending joint management of the mother–infant dyad, and breastfeeding when mothers are under investigation for COVID-19, or have tested positive for COVID-19, but are asymptomatic or paucisymptomatic (Academy of Breastfeeding Medicine [ABM], 2020; Davanzo et al., 2020; Istituto Superiore di Sanità [ISS], 2020; Royal College of Obstetricians & Gynecologists [RCOG], 2020; United Nations Children’s Fund [UNICEF], 2020). All these groups have suggested the compatibility of maternal COVID-19 infection with breastfeeding. Mothers who decide to breastfeed their infants should practice respiratory hygiene, including wearing a surgical mask covering their mouth and nose during breastfeeding and intimate contact. Mothers also need to wash their hands carefully before and after each contact with their child, and regularly wipe and disinfect surfaces touched (Davanzo et al., 2020; UNICEF, 2020; WHO, 2020b).

Only a limited number of associations/scientific groups (Wyckoff, American Academy of Pediatrics [AAP], 2020; Centers for Disease Control and Prevention [CDC], 2020a; and the Chinese Pediatric COVID-19 Working Group, Wang et al., 2020) have suggested a temporary separation of the mother–infant dyad with the exclusion of direct breastfeeding for a COVID-19 positive mother, independently of the clinical conditions of the mother. During this temporary separation, mothers who intend to breastfeed should be encouraged to express their milk in order to establish and to maintain their milk supply. All organizations and societies agree about the temporary separation of the mother from her baby when the COVID-19 positive mother is too sick to care for her baby.

At the moment no evidence of SARS-CoV-2 vertical transmission exists. The virus has not been detected in human milk, and transmission of SARS-CoV-2 via human milk has not been reported; although, it is likely that mothers could infect infants via the respiratory route whilst breastfeeding (Chen et al., 2020; De Rose et al., 2020a). The two main limitations of the few reports by researchers who studied the virus in milk are (1) the lack of a detailed description of method of milk collection; and (2) the lack of validation of the analytical method used as human milk has a complex composition (Chen et al., 2020; Liu et al., 2020; Peng & Zhou, 2020). Further studies with larger samples and with a

<sup>1</sup>Italian Association of Human Milk Banks (AIBLUD), Milan, Italy

<sup>2</sup>Neonatal Unit of the University, City of Health and Science, Turin, Italy

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## Corresponding Author:

Guido E. Moro, MD, Italian Association of Human Milk Banks (AIBLUD), Milan, Italy.

Email: [guidoemoro@tiscali.it](mailto:guidoemoro@tiscali.it)

### Key Messages

- Whenever possible, breastfeeding should be promoted and supported in mothers with suspected or confirmed COVID-19 infection, without disregarding the option of mother's milk expression.
- External surfaces of human milk containers could be contaminated by SARS-CoV-2. Protocols prepared according to the Hazard Analysis and Critical Control Points (HACCP) system should be utilized for correct handling of human milk containers.
- In human milk banks, a strict control of human milk donors for COVID-19 positivity should be performed during this critical period.
- Donations of human milk are decreasing during the COVID-19 pandemic for different reasons. The reduced volume of donor human milk available in human milk banks should be allocated to the smallest and most at risk preterm infants.

well-defined methodology are necessary to provide a more comprehensive answer to this question.

Breastfeeding saves lives. Researchers have shown that breastfeeding decreases the rate of necrotizing enterocolitis (NEC) and neonatal infections. It improves the health of mother and child, with benefits for families, and also has a social and economic impact (Davanzo et al., 2015; Vitoria et al., 2016). We can speculate that, similar to other coronaviruses, specific SARS-CoV-2 antibodies pass via mothers' milk from COVID-19 positive mother to the infant, thus modulating the clinical expression of the infant's infection. An approach involving routine separation of the newborn from the COVID-19 mother not only interferes with the mother-child relationship, but also deprives the fragile infant of the immunological advantages deriving from their own mother's milk with the subsequent protection against infections.

If the COVID-19 positive mother and her infant are separated immediately after birth, the mother should be encouraged to express her milk, thereby establishing and maintaining her milk supply. In this case, a dedicated breast pump should be provided, the mother should practice hand hygiene, wear a face mask, and gently wash the breast before each milk expression. After each utilization of the pump, all parts that come into contact with milk should be carefully washed and the whole pump should be appropriately disinfected according to the manufacturer's indications (CDC, 2020b; WHO, 2020c, 2020d). If the mother's milk is not available,

pasteurized donor milk from a human milk bank should be utilized. Use of human milk substitutes should be avoided.

### Handling of Human Milk Containers: The Controversial Issue

The importance of handling human milk containers when a mother and newborn are separated, and the infant is fed expressed milk, has been underlined recently by Marinelli and Lawrence (2020) and has been highly debated. Recently, researchers (Kampf et al., 2020; van Doremalen et al., 2020) who have studied the surface stability of SARS-CoV-2 have reported different values for virus stability, according to different surface materials. SARS-CoV-2 was more stable on plastic and glass, with contamination lasting 2–9 days on plastic surfaces, and 4–5 days on glass surfaces. The vast majority of human milk containers utilized in nurseries, Neonatal Intensive Care Units, and human milk banks are made of plastic, and a minority of glass. Therefore, these bottles may represent a possible source of contamination.

Due to the persistence of COVID-19 on plastic and glass surfaces, Marinelli and Lawrence (2020) called for cleaning and disinfecting the outside of containers of mothers' milk after expression from the breast. These authors suggested the use viricidal agents already in place in hospitals or, alternatively, "high level disinfection" of 0.5% solution, a dilution of 1:10 diluted bleach (Marinelli & Lawrence, 2020). A different approach was suggested by the Human Milk Banking Association of North America (HMBANA). This association does not consider human milk containers as high touch surfaces (Huslage et al., 2010); they support the Centers for Disease Control and Prevention (2020c) guidance about using disinfectants only on high touch surfaces and to clean food contact surfaces with routine sanitation procedures. In its document, HMBANA (2020) recommended "The Bottle Transfer Technique" as the preferred method to transfer human milk to a baby after expression from the breast. This is an interesting proposal, but we believe it is too complex to be applicable in the majority of maternity hospitals, which have to cope with the COVID-19 pandemic. In Italy, for example, pregnancies of COVID-19 positive mothers have been concentrated in COVID-19 Regional Centers, specifically equipped for the management of these high-risk pregnancies. The centers have special rooms for the mother-infant dyad. These rooms, with negative pressure, are managed by a midwife, a nurse, a neonatologist, an obstetrician, and an infectious disease specialist, all of whom take care of the dyad. All these people must wear the Personal Protective Equipment (PPE) needed for COVID-19 care, as established by the Italian Government (ISS, 2020). It is easy to understand how long it takes for health care providers working in these rooms to dress and to undress from this special equipment. In these conditions, the application of the procedure described in the HMBANA (2020) paper represents a further

complication. Besides, in Italy we utilize single-use, sterile bottles, and do not use plastic bags to collect the milk expressed from the breast. These are similar situations needing to be treated with different strategies in different countries. Due to the lack of scientific evidence on this issue, we suggest strict control of all the hygienic procedures described before for human milk expression and collection. At the moment it is not possible to give uniform and definitive recommendations for the correct handling of human milk containers. It is appropriate for each COVID-19 center to follow the local protocols, which should be prepared according to the *Hazard Analysis and Critical Control Points* (HACCP) system (Arslanoglu et al., 2010) and adapted to this new situation.

Usually, little, if any, attention is given to the type of feeding bottles used to collect and store milk. Feeding bottles may represent a carrier of microbes and viruses and may become a source of contamination in the case of COVID-19. To reduce the risk of contamination through milk containers and/or feeding bottles, silver ions are available on the market (Labor Baby, S.r.l., Tribiano, Milan, Italy). Tests performed on the use of silver ions showed a significant reduction of bacterial contamination on the exposed outer surface of the containers, due to the antibacterial activity of silver ions (Peila et al., 2016). The possible antiviral activity of these specific bottles should be tested with COVID-19; however, the results reported on this antimicrobial effectiveness represent a positive starting point.

## The Influence of COVID-19 on Milk Banking

The third issue considered in this paper is donation of human milk in the COVID-19 era. The world of human milk banking has been heavily affected by COVID-19. As underlined in the articles of Marinelli (2020) and Furlow (2020), COVID-19 is having a negative influence on human milk donation and the human milk banking system. Donations are decreasing and the volume of milk collected from human milk banks during this period is low. Donors' supplies have become a concern due to the global lockdown and travel restrictions. As a consequence, parents cannot go out to bring milk to the banks, even if theoretically this can be considered an action having social value. During this period, mothers prefer to stay as far away as possible from hospitals, especially those dedicated to COVID-19. The alternative is home milk collection by the milk bank staff; however, this activity has also been reduced due to the efforts required by hospitals devoted to care for people infected by COVID-19. In Italy, a special service for home milk collection, called the Human Milk Link, has been active for two of the three human milk banks in Milan (Mangiagalli Hospital and San Giuseppe Hospital), along with the Human Milk Bank of Turin. It is operated by a midwife, specialized in lactation, who has organized all the required activities to make the service

work (e.g., driving the car, collecting the milk, sealing the bottles) and providing breastfeeding advice to mothers. During 2019, this service collected 813L of human milk from 160 donors in Milan, and 99 liters from 20 donors in Turin. Human Milk Link's activities ceased on March 9, 2020, when the lockdown started in Italy. The donation of human milk in Milan has been completely interrupted. Fortunately, a few positive exceptions exist, for example the Human Milk Bank in Rome, Italy. This milk bank is still sending its drivers (less frequently than before) to collect milk directly at the donors' door, without entering the residence, while wearing protective equipment. In this way, they collected 49L of human milk during the month of March, 2020 (De Rose et al., 2020b).

The effect of pasteurization on SARS-CoV-2 virus inactivation in human milk banks has still to be determined. Researchers have documented complete heat inactivation of genetically similar viruses (e.g., SARS and MERS) by treatment at 60°C for 15–30 min. (Darnell & Taylor, 2006; Rabenau et al., 2005; van Doremalen et al., 2014). Recently, Chin et al. (2020) reported that SARS-CoV-2 is inactivated by heating in a dose-dependent manner, with viral inactivation at a temperature of 56°C for 30 min, or at 70°C for 5 min. However, their study simulated pasteurization in small aliquots, a procedure that does not fit human milk bank protocols. Therefore, these results should be replicated in a human milk bank setting.

Taking into account the available information, a milk bank should suspend, for 2 weeks, the recruitment of mothers who are suspected or have a probable case of COVID-19, in order to ensure they do not become ill during this period (European Milk Bank Association [EMBA], 2020). If an already established donor develops clinical signs of a COVID-19 infection, a rhinopharyngeal swab is recommended. Donation should be temporarily discontinued until the result of the swab is available. If the culture is positive for COVID-19, donation should be interrupted until two consecutive negative cultures are present, then donation can restart (EMBA, 2020).

## Conclusion

During this period of declining donations to human milk banks all around the world, we have to realize that the resources may need to be rationed. The low volume of donor human milk available should be allocated to the smallest and most at risk preterm infants (e.g., birth weight < 1500 grams or a gestational age < 30 weeks) to prevent NEC and other severe illnesses occurring in these extremely fragile infants. For these infants, human milk really makes the difference!


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## ORCID iD

Guido E. Moro  <https://orcid.org/0000-0002-3429-3257>

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