

FOREWORD:

INFANT AND YOUNG CHILD FEEDING IN THE CONTEXT OF A BIOLOGICAL ATTACK

This guidance note is a document developed by the IFE Core Group Sub-Working Group on Infant and Young Child Feeding in Emergencies (IYCF-E) in the context of biological threats. A biological agent attack is the intentional release of a virus, bacteria, or other microorganisms that can kill or sicken people, livestock, or crops.¹ In the event of a biological agent attack on a population, large numbers of people may be impacted. Biological agent attacks are challenging because they more often involve covert dissemination and may not have an immediate impact because of the delay between exposure and illness.²

The following guidance note serves to outline key facts on IYCF in the context of a biological attack, including management and treatment, and recommendations for breastfeeding and infant feeding. The guidance note is intended for policymakers and for people who will provide guidance for health facilities and healthcare workers in the case of a biological attack. There are a wide variety of possible agents that can be used in a biological attack, and therefore this guidance note will prioritize those most likely to be used, describing how IYCF could be impacted. Those agents currently include anthrax, botulism, plague, Ebola, tularemia, Q fever, and smallpox. This guidance note is considered a living document. Currently, the guidance presented is based on the most recent research and evidence. As more information and research become available regarding the treatment of breastfeeding women who are exposed to biological agents, we will continue to update as needed. **For more information, please contact ife@enonline.net**

The guidance note is part of a larger body of work called Chemical, Biological, Radiological and Nuclear (CBRN) Threats In War Time Situations: The Impact on Breastfeeding Safety and Infant/Young Child Feeding Practices. It can be accessed at: <https://www.enonline.net/cbrn-iycfe>

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¹ CDC. 2020. Anthrax as a Bioterrorism Weapon. [Accessed 5th of May 2022]. Available from: <https://www.cdc.gov/anthrax/bioterrorism/index.html>

² CDC MMWR. 2000. Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response. [Accessed 5th of May 2022]. Available from: <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr4904a1.htm>

GUIDANCE NOTE:

INFANT AND YOUNG CHILD FEEDING IN THE CONTEXT OF A BIOLOGICAL ATTACK

This guidance note is a document developed by the IFE Core Group Sub-working Group on Infant and Young Child Feeding in Emergencies (IYCF-E) in the context of chemical, biological, radiological and nuclear threats. Its purpose is to outline the key facts on IYCF in the context of a biological weapon emergency to inform emergency plans and responses. The guidance note is intended for policymakers and for people who will provide guidance for health facilities in the case of a biological attack. **There are a wide variety of possible agents that can be used in a biological attack, and therefore this guidance note will prioritise those most likely to be used, describing how IYCF could be impacted. For more information, please contact ife@enonline.net.**

Background

A biological attack is the intentional release of a virus, bacteria or other microorganisms that can kill or sicken people, livestock or crops.¹ In the event of a biological agent attack on a population, large numbers of people may be impacted. Biological agent attacks are challenging because they more often involve covert dissemination and may not have an immediate impact because of the delay between exposure and illness.² Some potential agents that may be used in a biological attack are anthrax, botulism, plague, Ebola, tularemia, Q fever, and smallpox.

Breastfeeding provides infants with hydration, comfort, connection, and high-quality nutrition. It protects them against disease and provides food security. This protection and security are critical during emergencies when there is often a lack of access to clean water, electricity, food supplies, and healthcare. Breastfeeding also has important consequences for maternal health and caregiving capacity. It is critically important to provide caregivers with clear and accurate information, reassurance, and guidance, to protect, promote, and support appropriate infant and young child feeding (IYCF) in the event of a biological attack and to ensure that women do not stop breastfeeding unnecessarily.

In order to weigh the risks and benefits of breastfeeding, multiple factors must be considered. These include the known short- and long-term benefits of breastfeeding for the infant, the immediate need for medication for the mother, the potential impact of the drug on milk production, the amount of drug excretion into breastmilk, and the potential adverse effects on the breastfeeding infant. A chart outlining the safety of common antimicrobials and treatments and breastfeeding is included in Appendix 1. Table 1 serves as a summary of the information contained in the guidance note.

Table 1: Summary of Breastfeeding safety and Treatment by Biological Agent/Disease. Note: If there are clear guidelines on when breastfeeding can be resumed, the guidance states “temporarily interrupt” and will give recommendations of when it is safe to resume. If there are no evidence-based guidelines on when to resume, the guidance uses the word “halt”.

Agent/ Disease	Spread (Person- to-person)	Treatment for breastfeeding women	Treatment for infants and young children	Is breastfeeding safe after exposure?	Is breastfeeding safe during treatment?
Anthrax	No	Antibiotics – first-line treatment – ciprofloxacin, levofloxacin, moxifloxacin; amoxicillin (if strain is susceptible to penicillin).	Antibiotics – ciprofloxacin and doxycycline; amoxicillin if strain is susceptible to penicillin.	<p>Yes. Breastfeeding is safe to continue after exposure.</p> <p>Women with active skin lesions from anthrax on the breast should avoid infant contact with the affected breast and not breastfeed from that breast until 48 hours after appropriate antimicrobial therapy has been initiated.³</p> <p>Expressed breastmilk can be used safely if hygiene and protective precautions were taken during expression, including hand washing and ensuring that no lesions come in contact with pump equipment if using pump.</p>	Yes. Breastfeeding is safe to continue during treatment.
Botulism	No	Supportive care (including assisted breathing using a ventilator for breathing difficulties and IV fluids if the person cannot swallow); early IV administration of botulinum antitoxin heptavalent (HBAT). ⁴	<p>Supportive care and early IV administration of HBAT.</p> <p>US FDA-approved HBAT dose for infants (persons aged <1 year) – 10% of the adult dose, regardless of weight. HBAT dose for children (persons aged 1–16 yrs.) – 20%–100% of the adult dose.⁵</p>	<p>While current evidence is limited, the evidence that exists suggests that breastfeeding by an infected mother is not harmful to her infant.⁶</p> <p>It is unlikely that botulinum toxin enters breastmilk because of its large molecular weight.⁶</p> <p>Infants of breastfeeding mothers should be monitored closely for signs and symptoms of botulism such as low muscle tone, a weak cry, gastro-intestinal symptoms or difficulty feeding and swallowing.⁶</p>	<p>Yes. Breastfeeding can continue while receiving the antitoxin HBAT.</p> <p>Infants of breastfeeding mothers should be monitored closely for signs and symptoms of adverse impacts from botulinum antitoxin if given to mother and/or infant including flu-like symptoms, such as fevers, chills, and malaise.⁶</p>

Table 1 continued...

Ebola	Via fluids	Supportive treatment. Vaccine if exposed and not yet symptomatic. ⁷ Breastfeeding women infected with Ebola (or those with high-risk exposures) can also receive Ebanga and Inmazed. ⁸	Supportive treatment.	No. Breastfeeding should be halted if Ebola Virus Disease (EVD) is confirmed in either mother or child, or if either one has confirmed exposure. Expressed breastmilk should be discarded. If mother and child with potential exposure and no symptoms, breastfeeding infants under 6 months may be considered if no alternative options are available. ⁹	No.
Plague	Yes	Antibiotics – ciprofloxacin, streptomycin, levofloxacin, moxifloxacin, gentamicin, and doxycycline. Chloramphenicol is also considered effective but has the potential for serious adverse reactions in infants so other drugs should be used preferentially for breastfeeding mothers.	Antibiotics for children >1 month include gentamicin, streptomycin, ciprofloxacin, levofloxacin. ¹⁰	No. Breastfeeding should be temporarily interrupted until both mother and infant receive antimicrobial treatment or post-exposure prophylaxis (PEP). ¹⁰	Yes. If a mother and infant are both receiving antimicrobial treatment or post-exposure prophylaxis (PEP), then a mother with pneumonic plague may continue to breastfeed safely. ¹⁰ If an infant does not receive antimicrobial treatment or PEP at the same time as the mother, the mother with pneumonic plague should temporarily interrupt breastfeeding until she has received 48 hours of antimicrobial treatment. ¹⁰
Q Fever	No	Antibiotics – doxycycline.	Antibiotics – doxycycline.	Yes. Breastfeeding is safe to continue after exposure. ¹¹	Yes. Breastfeeding is safe to continue during treatment. ¹¹

Table 1 continued...

Smallpox	Yes	Supportive treatment. Vaccinate if exposed and not yet symptomatic. ¹²	Supportive treatment.	If the mother or infant is a confirmed case of smallpox and has symptoms, halt breastfeeding. ¹³ Since people cannot transmit infection until they begin to show symptoms of fever and rash, personal contact between mother and infant can continue, including breastfeeding, until the onset of fever. ¹³ If either mother or infant develops fever, immediate isolation should begin. ¹³	If a mother is exposed to smallpox but does not yet show any symptoms, she may receive a vaccine (JYNNEOS is recommended for breastfeeding women) to prevent smallpox infection. ¹⁴ Once the mother receives the vaccine, breastfeeding can continue with proper infection control to avoid contact with the vaccine site. Mother should temporarily halt breastfeeding from that breast if breast lesions are present. ¹⁴
Tularemia	No	Antibiotics – streptomycin, gentamicin, doxycycline, and ciprofloxacin. ¹⁵	Antibiotics – gentamicin, doxycycline, ciprofloxacin. ¹⁵	Yes. Breastfeeding is safe to continue after exposure.	Yes. Breastfeeding is safe to continue during treatment.

Appendix 2 outlines BMS and re-lactation guidance for use in cases where breastfeeding must be halted or delayed.

Agent/Disease

ANTHRAX

Breastfeeding summary

- Breastfeeding is safe to continue.
- Women with active skin lesions from anthrax on the breast should avoid infant contact with the affected breast and not breastfeed from that breast until 48 hours after appropriate antimicrobial therapy has been initiated.¹⁶

Key facts

- Anthrax is an infectious disease that is caused by the bacteria *Bacillus anthracis* (*B. anthracis*) and is one of the most likely agents to be used in a biological attack.¹
- Microscopic spores produced by these bacteria could easily be put into powders, food, or water.¹
- It could also be released into the air via a plane, truck or the ventilation system of a building, be blown by the wind or carried on people’s clothing or other objects.¹
- Anthrax generally is not passed through person-to-person transmission.³

Symptoms

- The incubation period of inhalation anthrax is 1 to 7 days but can be shorter if exposed to a large number of spores.¹⁷
- Symptoms of inhalation anthrax include initial flu-like illness with fever, headache, cough, and fatigue.¹⁸
- By the fourth day after symptom onset, this can progress to severe dyspnoea and shock and is usually fatal if untreated.¹⁸

Treatment

- In the event of a large-scale release of *B. anthracis* spores, the public health response will focus on post-exposure prophylaxis (PEP) to protect the population.
- A combination of antimicrobial PEP for protection during the first 60 days after exposure and a 3-dose vaccination series for long-term protection after exposure to spores is recommended.¹⁸
- For those with a known exposure, a monoclonal antibody treatment called raxibacumab is available that is used in combination with antimicrobial treatment.¹⁹

In the event of mass *B. anthracis* exposure, the recommendations are as follows:

Breastfeeding mothers

- Antimicrobials used for treatment and PEP of systemic anthrax include ciprofloxacin, levofloxacin, moxifloxacin, and amoxicillin.¹⁸
- Ciprofloxacin is considered the best first-line agent of choice for treatment and PEP for breastfeeding women and is safe for infants.⁵ Infants should be monitored for possible side effects of ciprofloxacin such as diarrhoea or thrush when given to either mother or infant.¹⁸ Refer to Appendix 1 for the full list of medications commonly used in treatment of biological attacks.
- Physicians may also prescribe amoxicillin if the strain of anthrax is susceptible to penicillin.¹⁸ Breastfeeding can continue with the use of amoxicillin as it is safe for use with infants and breastfeeding women.²⁰
- Anthrax vaccine (AVA) should be given to all exposed adults, including breastfeeding women at 0, 2 and 4 weeks in combination with a total of 60 days of PEP.¹⁸
- Raxibacumab is a monoclonal antibody indicated for the treatment of adult and pediatric patients with inhalational anthrax due to *B. anthracis* in combination with appropriate antibacterial drugs.¹⁹ It has not been evaluated in breastfeeding women. Given it is a large protein molecule, it is unlikely to be excreted in breastmilk.¹⁹
- Given the unknown impact of raxibacumab on breastmilk, ciprofloxacin remains the best course of treatment for women who wish to continue breastfeeding.

Infants

- For children over 6 weeks of age who are exposed to anthrax, they should receive PEP for 60 days after exposure as well as the 3-dose AVA series.¹⁸
- The preferred antimicrobial is ciprofloxacin or doxycycline.²¹ As with adults, amoxicillin can be used for penicillin-susceptible strains.²⁰ Infants should be monitored for possible side effects of ciprofloxacin such as diarrhoea or thrush when given to either mother or infant.²⁰
- For children less than 6 weeks of age, they should start immediately on antimicrobial PEP and the vaccine series delayed until the child reaches 6 weeks of age.²¹
- AVA should not be given at the same time as routine childhood vaccinations and should take priority over routine vaccinations since there is no information on the interaction between AVA and routine vaccination series common in childhood.²¹ Routine vaccinations can resume 4 weeks after the last AVA dose.²¹

Breastfeeding safety

- There is no evidence that anthrax can be transmitted through breastmilk, therefore women can continue to breastfeed if exposure is suspected.¹⁶
- Women with active skin lesions from anthrax on the breast should avoid infant contact with the affected

breast and not breastfeed from that breast until 48 hours after appropriate antimicrobial therapy has been initiated.¹⁶

- Expressed breastmilk can be used safely if hygiene and protective precautions were taken during expression, including hand washing and ensuring that no lesions come in contact with pump equipment if using pump.
- Breastfeeding can continue during treatment for anthrax, including while receiving the vaccination series.¹⁶
- Given the safety of the treatment options available, as stated above, there is a very low risk of overtreating the breastfeeding infant because of exposure to medication from the mother. Therefore, dosages remain the same for breastfeeding and non-breastfeeding infants.²¹

BOTULISM

Breastfeeding summary

- It is unlikely that botulinum toxin enters breastmilk because of its large molecular weight.^{6,i} While current evidence is limited, the evidence that exists suggests that breastfeeding by an infected mother is not harmful to her infant.⁶
- Infants of breastfeeding mothers should be monitored closely for signs and symptoms of botulism such as low muscle tone, a weak cry or difficulty feeding and swallowing.
- Breastfeeding can continue while the mother is receiving the antitoxin HBAT.

Key facts

- Botulism is caused by toxins formed by the bacteria *Clostridium botulinum* (*C. botulinum*).⁴
- It is possible to release the toxins of *C. botulinum* into the food supply or air, making people sick through ingestion or inhalation.⁴
- Botulism is not transmitted person-to-person and people do not need to be isolated.⁴

Symptoms

- Signs and symptoms of botulism evolve over a few hours to days.⁴
- Botulism toxin causes symmetric, bilateral flaccid paralysis, beginning with the head and neck muscles and progressing to the trunk, arms, and legs.⁴
- Initial signs and symptoms may include drooping eyelids, blurry vision, difficulty moving the eyes and double vision.⁴
- People with foodborne botulism may also have vomiting, nausea, stomach pain and/or diarrhoea.⁴
- People may have difficulty swallowing and lose their protective gag reflex and use of respiratory muscles. Without treatment, death can result from airway obstruction and respiratory failure.⁴

Treatment

- Treatment includes supportive care (including assisted breathing using a ventilator for breathing difficulties and IV fluids if the person cannot swallow) and early IV administration of botulinum antitoxin heptavalent (HBAT).⁴
- HBAT should be used for the treatment of symptomatic botulism as soon as possible in the case of documented or suspected symptomatic exposure for all age groups, including infants and young children.⁶
- Breastfeeding women should be treated with the same dosage recommendations as the general population. The approved HBAT dose for infants (persons aged <1 year) is 10% of the adult dose, regardless of weight. The HBAT dose for children (persons aged 1-16 years) is 20%-100% of the adult dose.⁶

Breastfeeding safety

- It is unlikely that botulinum toxin enters breastmilk because of its large molecular weight.^{6,i} While current evidence is limited, the evidence that exists suggests that breastfeeding by an infected mother is not harmful to her infant.⁶

ⁱ Medications with a molecular weight >800 daltons are less likely to achieve clinically relevant levels in breastmilk. The molecular weight of botulinum toxin is 150,000 daltons.¹⁰

- Infants of breastfeeding mothers should be monitored closely for signs and symptoms of botulism such as low muscle tone, weak cry or difficulty feeding and swallowing.⁶
- Breastfeeding can continue while the mother is receiving the antitoxin HBAT.
- Although it is not known if the antitoxin HBAT is excreted in breastmilk, its large molecular weight should prevent it from entering breastmilk.^{5,6} HBAT has been found safe to use in infants for botulinum toxin treatment.
- Infants should also be monitored for adverse impacts from botulinum antitoxin if given to mother and/or infant including flu-like symptoms, such as fevers, chills, and malaise.⁵

EBOLA

Breastfeeding summary

- Halt breastfeeding if Ebola Virus Disease (EVD) is confirmed in either mother or child, or if either has confirmed exposure.
- If mother or child has a potential exposure and no symptoms, breastfeeding infants under 6 months may be considered if no alternative options are available.⁹
- Appendix 3 provides comprehensive guidance, including 2020 WHO guidelines for pregnant and breastfeeding women in the context of EVD.

Key facts

- EVD is a rare but highly contagious infectious disease with a case fatality rate of 25-90%.⁷
- EVD spreads through person-to-person transmission via direct contact with bodily fluids (blood, saliva, sweat, etc.) from a person who is sick with or has died from EVD, or from objects that have been contaminated with bodily fluids from a person who is sick with or who has died from EVD.⁷
- A person infected with EVD cannot spread the disease until they develop symptoms.⁷
- Because of its high death rate and easy person-to-person transmission, the Ebola virus has the potential to be used as a bioweapon if dispersed in aerosol form.²²

Symptoms

- The incubation period is between 2 and 21 days.²²
- Initial symptoms can be sudden and include fever, fatigue, muscle pain, sore throat, and headache. This is followed by vomiting, diarrhoea, impaired kidney and liver function and, in some cases, internal and external bleeding.²²

Treatment

- Supportive care, including oral and IV rehydration and treatment of specific symptoms, improves survival.²²
- Two monoclonal antibodies were approved for the treatment of Zaire Ebolavirus (Inmazeb and Ebanga).⁸
- The ERVEBO vaccine has also shown to be effective in protecting people from Zaire Ebolavirus and is approved for individuals over 18 years of age. While the vaccine was not approved for use in pregnant and breastfeeding women, the World Health Organization (WHO) recommends the use of ERVEBO in breastfeeding women in areas experiencing an active EVD outbreak (as a so-called ring vaccination).²³

Breastfeeding safety

- The WHO recommends that breastfeeding should stop if EVD is confirmed in either a breastfeeding mother or a breastfed child.⁹ The infant or child should be separated from the mother and infants younger than 6 months should be provided donor human milk or a breastmilk substitute.⁹ The children should be monitored closely for 21 days post-exposure.⁹
- Separation of mother and child and temporary halting of breastfeeding is ideal from a transmission risk perspective. However, if the infant is under 6 months old and no safe alternatives are available, or if the infant cannot be cared for, the option not to separate and the continuation of breastfeeding can be considered.⁹
- If a breastfeeding woman who is recovering from EVD wishes to continue or resume breastfeeding, she should be supported to do so.⁹

- Following recovery from EVD, if a woman wants to resume breastfeeding, she should wait for two consecutive negative Ebola virus breastmilk tests (separated by 24 hours) before resuming.⁹ See Appendix 2 for guidance on supporting mothers with re-lactation.
- According to the WHO, data is not available to assess the impact of the ERVEBO vaccine on breastmilk, on a mother's milk production or its effects on the breastfed child.²³ As stated above, while the vaccine was not approved for use in pregnant and breastfeeding women, the WHO recommends the use of ERVEBO in breastfeeding women in areas experiencing an active EVD outbreak (as a so-called ring vaccination).²³
- The health benefits of breastfeeding should be considered alongside the mother's clinical need for the vaccine as well as potential adverse events from the vaccine or the mother's risk from or susceptibility to the Ebola virus.⁹

PLAGUE

Breastfeeding summary

- If a mother and infant are both receiving antimicrobial treatment or PEP, then a mother with pneumonic plague may continue to breastfeed.¹⁰
- If an infant does not receive antimicrobial treatment or PEP at the same time as the mother even if the infant was not initially exposed, the mother with pneumonic plague should temporarily interrupt breastfeeding until they have both received 48 hours of antimicrobial treatment, given that pneumonic plague can spread person-to-person through large respiratory droplets.¹⁰

Key facts

- Plague is an infectious disease that is caused by the bacterium *Yersinia pestis* (*Y. pestis*).
- Plague is considered one of the most serious biological threats due in part to its low infectious dose, high case fatality rate in untreated infection and history of use as an agent of bioterrorism.²⁴
- Pneumonic plague can occur after inhalation of *Y. pestis* after an intentional release in the air.^{24,ii}
- Pneumonic plague can spread person-to-person through large respiratory droplets between the close contacts of symptomatic individuals.²⁴

Symptoms

- The incubation period of pneumonic plague is 2 to 4 days (range 1 to 6 days) after exposure.²⁴
- Symptoms include fever, headache, weakness, and pneumonia with shortness of breath, cough, and chest pain.²⁴
- The pneumonia may cause respiratory failure and shock.¹⁵ Without treatment, pneumonic plague is usually fatal.²⁴

Treatment

- Pneumonic plague is treatable with antibiotic therapy which should be started within 24 hours of patients showing symptoms and should be continued for 10-14 days.²⁴
- Preventative antibiotics may be given to people, including breastfeeding women, infants, and young children, who have had known contact with infected patients and should be given for 7 days.¹⁰ People with suspected exposure should be monitored and started on antibiotics immediately if symptoms start.
- Given the risk of person-to-person transmission through respiratory droplets, standard respiratory infection precautions should be used (masks, gloves, eyewear, hand hygiene).¹⁰
- Commonly available antimicrobials are effective for the treatment of pneumonic plague including ciprofloxacin, streptomycin, levofloxacin, moxifloxacin, and doxycycline and gentamicin.²⁴ Chloramphenicol is also considered effective as an alternative treatment option.¹⁰ Refer to Appendix 1 for a full list of medications commonly used in biological attacks.
- Dual therapy with two distinct classes of antimicrobials is recommended for treatment of plague after an intentional release of *Y. pestis*.¹⁰

ⁱⁱ Less common types of the plague include bubonic and septicemic plague, but those forms are usually not associated with bioweapon attacks.

Breastfeeding safety

- If a mother and infant are both receiving antimicrobial treatment or PEP, then a mother with pneumonic plague may continue to breastfeed.¹⁰
- The risk of transmitting *Y. pestis* through breastmilk is believed to be low.¹⁰ However, given the risk of person-to-person transmission of pneumonic plague, if an infant does not receive antimicrobial treatment or PEP at the same time as the mother, mothers with pneumonic plague should temporarily interrupt breastfeeding until they have received 48 hours of antimicrobial treatment.¹⁰ Regular expression of breastmilk is recommended, and the expressed milk can be given to infants during this period of time.¹⁰
- Most antimicrobials recommended for *Y. pestis* treatment or prevention (including ciprofloxacin, streptomycin, levofloxacin, moxifloxacin, doxycycline, and gentamicin) are safe for use in breastfeeding mothers.²⁰
- Chloramphenicol should be avoided in breastfeeding mothers if possible.²⁵ If a mother must receive chloramphenicol during breastfeeding, it is important to monitor the infant for gastro-intestinal disturbances and to monitor the mother for changes in milk supply.²⁵ In some cases, it might be necessary to temporarily interrupt breastfeeding if the infant shows adverse effects while a mother is taking chloramphenicol.²⁵ Appendix 1 provides a full list of medications and breastfeeding safety.

Q FEVER

Breastfeeding summary

- Breastfeeding is safe to continue.

Key facts

- Q fever is caused by infection with the bacteria *Coxiella burnetii* (*C. burnetii*).²⁶ *C. burnetii* is considered a possible biothreat as it can be aerosolised, only requires a small amount to be infectious, and is resistant to heat, drying and many common disinfectants.²⁶
- While Q fever can be incapacitating, the fatality rate is very low.²⁶
- Person-to-person transmission is extremely rare.²⁶

Symptoms

- Acute Q fever is typically a mild flu-like disease and can include headache, rash, and joint pain.
- Severe symptoms include pneumonia, hepatitis, and myocarditis.²⁷

Treatment

- Q fever can be treated with a 2-week course of doxycycline for both adults and for infants and young children.²⁶

Breastfeeding safety

- There have not been any documented cases of transmission of Q fever through breastfeeding.
- The European Center for Disease Control recommends that women continue breastfeeding except in very rare cases of chronic Q fever that warrant the long-term treatment of the mother.¹¹
- Breastfeeding is safe to continue while taking doxycycline.²⁰ Appendix 1 provides a full list of medications and breastfeeding safety.

SMALLPOX

Breastfeeding summary

- If the mother or infant is a confirmed case of smallpox (and shows symptoms), halt breastfeeding.¹²
- Since people cannot transmit infection until they begin to show symptoms of fever and rash, personal

contact between mother and infant can continue, including breastfeeding, until the onset of fever.¹² If either mother or infant develops fever, immediate isolation should begin.

- If a mother is exposed to smallpox, but does not yet show any symptoms, she may receive a vaccine to prevent smallpox infection.¹⁴ Once the mother receives the vaccine, breastfeeding can continue with proper infection control to avoid contact with the vaccine site. A mother should temporarily interrupt breastfeeding from that breast if breast lesions are present.¹²

Key facts

- Smallpox is an infectious disease caused by the variola virus.
- Although smallpox no longer exists in nature, it is considered a serious threat if used as a bioweapon.
- Smallpox is primarily spread person-to-person via infectious respiratory droplets during close contact with those who are symptomatic of the disease.
- Fluid from lesions, contact with scabs and contaminated objects such as bandages, bedding and clothing can also be a source of spread.²⁸
- Smallpox is fatal in 30% of cases.²⁸

Symptoms

- The incubation period for smallpox ranges from 7-17 days.²⁹
- During this time, the exposed person is not contagious and will likely show no symptoms.²⁹
- Early symptoms include high fever, fatigue, and severe back pain.²⁹ A few days later, the virus causes a rash with bumps full of clear liquid which later fill with pus. The lesions will scab over and eventually dry and fall off. The rash most often begins on the face and hands and then spreads to the rest of the body.²⁹
- A person remains infectious until the lesions resolve, scabs fall off, and a fresh layer of skin has formed.²⁹

Treatment

- There is no cure for smallpox, but vaccination can be used to prevent infection from developing if given up to 4 days after a person has been exposed to the virus.
- In a smallpox emergency, a ring vaccination strategyⁱⁱⁱ will likely be used to vaccinate those most at risk. This ensures that everyone who has been or could have been exposed to a patient with smallpox receives the vaccine.¹²
- There are three available smallpox vaccines – Imvamune (JYNNEOS), ACAM2000, and APSV.^{30, iv} The vaccines do not contain the variola virus, the virus responsible for smallpox.
- ACAM2000 and APSV are ‘replication-competent vaccines’ which means they use live, infectious vaccinia virus (which is not a smallpox virus) that protects against smallpox disease.³⁰ This means that the vaccine replicates vaccinia virus in the human body and the vaccinia virus can potentially be spread to others if someone comes into contact with a blister on the skin while the blister is healing.^v
- JYNNEOS is a weakened virus vaccine (called attenuated) and is non-replicating, meaning it cannot replicate in the human body. JYNNEOS uses a technology similar to chickenpox or MMR vaccines and has fewer side effects and risks than ACAM2000 or APSV and cannot easily spread the vaccinia virus to others.¹⁴

Breastfeeding safety

- Since people cannot transmit infection until they begin to show symptoms of fever and rash, personal contact between mother and infant can continue, including breastfeeding, until the onset of fever.¹³ If either mother or infant develops fever, immediate isolation should begin.
- Breastfeeding women who are exposed to smallpox or at high risk for smallpox infection should ideally be vaccinated with the JYNNEOS vaccine.^{14,31}
- Currently, ACAM2000 and APSV are not recommended for use in breastfeeding women.³² If ACAM2000 is used, breastfeeding women should be counselled on proper infection control to avoid passing on the vaccinia virus from the vaccination site to breastfeeding infants.¹² Mothers should be advised to consistently use protective bandages to cover the vaccination site, wear long-sleeved clothing, wash hands thoroughly

ⁱⁱⁱ Ring vaccination strategy vaccinates the contacts of confirmed patients and people who are in close contact with those contacts.

^{iv} APSV is currently listed as an investigational vaccine only. The two main vaccines being used are ACAM2000 and JYNNEOS.

^v The vaccinia virus can cause localised skin lesions, fever, swollen lymph nodes, malaise, and body aches.

before handling infants and avoid infant contact with the vaccination site until the vaccine site has healed.¹² Clothing and towels that come in contact with the vaccination site should be separated from other household laundry and washed separately.

- It is not known whether the vaccinia virus (in the smallpox vaccine) is excreted in breastmilk. Given the well-known infant and maternal benefits of breastfeeding and the small potential risk for transmission of the vaccinia virus to infants via breastmilk, breastfeeding should continue.¹⁴ If there is a cutaneous breast lesion that is suspicious for vaccinia virus infection after vaccination, it is recommended that women temporarily interrupt breastfeeding from that breast until the breast lesion heals.¹⁴

TULAREMIA

Breastfeeding summary

- Breastfeeding is safe to continue.

Key facts

- Tularemia is a potentially serious illness that is caused by the bacterium *Francisella tularensis* (*F. tularensis*).³³
- Because *F. tularensis* is extremely infectious, a small number of organisms can cause disease and therefore could be used as a bioweapon.³³
- The most likely route of infection for this bacterium to be used as a bioweapon would be via aerosolisation.³³
- People who inhale the bacterium develop pneumonic tularemia with symptoms of severe respiratory illness which can be fatal if not treated quickly.¹⁵
- Tularemia is not spread from person-to-person and people with tularemia do not need to be isolated.¹⁵

Symptoms

- The incubation period for tularemia is often 3 to 5 days but can range from 1-14 days.³³
- Illness ranges from mild to life-threatening and usually includes a high fever.
- Patients with pneumonic tularemia present with cough, chest pain, and difficulty breathing.³³

Treatment

- Tularemia is treated with antibiotics, most commonly streptomycin, gentamicin, doxycycline, or ciprofloxacin.¹⁵
- Treatment duration should be 10-21 days.¹⁵

Breastfeeding safety

- Because tularemia is not spread person-to-person, it is safe for mothers to continue breastfeeding after exposure and/or while receiving antibiotic treatment for tularemia.
- Antibiotics used to treat tularemia are all considered safe for women to receive while breastfeeding.²⁰ Please refer to Appendix 1 for a full list of medications and breastfeeding safety.

CONCLUSION

This guidance note is considered a living document. Currently, the guidance presented is based on the most recent research and evidence. As more information and research become available regarding the treatment of breastfeeding women who are exposed to biological agents, we will continue to update as needed. If women need to temporarily interrupt breastfeeding, Appendix 2 provides resources for support and guidance.

Appendix

Appendix 1: Medications commonly used in the treatment of biological agents and use in breastfeeding women

Antimicrobial Agent	US National Library of Medicine – LACTMED ²⁰	Briggs' Pregnancy and Lactation ³⁴	Dr. Hales – Medication and Mother's Milk ³⁵	EmbryoTox – Germany ³⁶
Amoxicillin	Acceptable to use	Compatible	L1: Limited data – compatible	Safe during breastfeeding
Ampicillin	Acceptable to use	Compatible	L1: Limited data – compatible	Safe during breastfeeding
Chloramphenicol	Alternate drug is preferred	Limited human data – potential toxicity	L4: Limited data – probably hazardous	Contraindicated during breastfeeding
Ciprofloxacin	Acceptable to use if monitoring infants for diarrhoea or thrush	Limited human data – potential toxicity over time	L3: Limited data – probably compatible	Acceptable during breastfeeding
Doxycycline	Short-term use (less than 21 days) is acceptable. Avoid prolonged use because of possible staining of the infant's dental enamel	Compatible	L3: Limited data – probably compatible	Acceptable during breastfeeding
Gentamicin	Acceptable to use	Compatible	L2: Limited data – probably compatible	Acceptable during breastfeeding
Levofloxacin	Acceptable to use with monitoring infants for diarrhoea or thrush.	Limited human data – probably compatible	L2: Limited data – probably compatible	Acceptable during breastfeeding
Moxifloxacin	Little information is available on the use of moxifloxacin during breastfeeding Acceptable to use if monitoring infants for diarrhoea or thrush. Preferable to use an alternative drug for which safety information is available	Limited human data – probably compatible	L3: No data – probably compatible	Acceptable during breastfeeding
Raxibacumab	Because raxibacumab is a large protein molecule, the amount in milk is likely to be very low. It is also likely to be partially destroyed in the infant's gastrointestinal tract and absorption by the infant is probably minimal. Until more data becomes available, should be used with caution during breastfeeding	No data	L3: No data – probably compatible	No data
Streptomycin	Acceptable to use with monitoring infants for diarrhoea or thrush	Compatible	L3: Limited data – probably compatible	Use with caution

Appendix 2: Support if breastfeeding needs to be temporarily interrupted³⁷

The vast majority of mothers can and should breastfeed, just as the vast majority of infants can and should be breastfed. Only under exceptional circumstances can a mother's milk be considered unsuitable for her infant. For those few health situations where infants cannot, or should not, be breastfed, the choice of the best alternative – expressed breast milk from an infant's own mother, breast milk from a healthy wet-nurse or a human-milk bank or a breast-milk substitute fed with a cup, which is a safer method than a feeding bottle and teat – depends on individual circumstances.

Relaction

If breastfeeding is temporarily interrupted, mothers and infants need support to protect their breastmilk supply and re-lactate once they are ready to resume breastfeeding.

During any temporary interruption of breastfeeding, women should be supported to maintain their breastmilk supply through frequent breastmilk expression (either through hand expression or pump).^{vi} Expressing breastmilk is also important to avoid discomfort and breast infections. Women should be supported to increase their breastmilk supply and re-lactate once they are ready to resume breastfeeding. If mothers have breastmilk that was expressed and stored before the exposure, this can be used to feed the infant. If breastmilk is frozen, thaw the sealed bag/contained of milk in a bowl of warm water from a safe source (tap or bottled depending on emergency). An easily cleaned cup (i.e., open, without a teat or spout) should be used to feed the infant expressed breastmilk (see below). If breastmilk expressed before the biological attack is not an option, infants should be fed with an appropriate breastmilk substitute if available.

Important links:

<https://www.lli.org/increasing-breastmilk-supply/>

<https://www.unicef.org.uk/babyfriendly/maximising-breastmilk-and-re-lactation-guidance/>

<https://abm.me.uk/breastfeeding-information/relactation/>

Artificially fed or non-breastfed infants

For infants being fed breastmilk substitutes, ready-to-use infant formula and powdered infant formula already in the home or manufactured before the biological attack are suitable for consumption.

If infants under 6 months of age are being fed breastmilk substitutes, mothers and caregivers should be advised to use ready-to-use infant formula (RUIF) if this is available. RUIF carries the least risk for formula-fed infants during a biological attack. If RUIF is not available, then powdered infant formula (PIF) should be used. PIF should be made using bottled water. If this is not possible, tap water can be used if the local authorities say it is safe. For infants over 6 months of age, alternative milks (such as ultra-high temperature milk, fermented milk or yogurt, pasteurised or boiled full-cream animal milks or reconstituted evaporated milk) may be used instead of RUIF and PIF.

An easily cleaned cup (i.e., open, without a teat or spout) should be used to feed the infant breastmilk substitutes and expressed breastmilk. Bottles, teats or cups with a lid are hard to clean in an emergency. Using bottles, teats or cups with a spout may also limit the successful restarting of breastfeeding as they reduce suckling.

Important links:

UNICEF BMS Procurement 2021: <https://www.unicef.org/media/100911/file/BMS-Procurement-Guidance-Final-June-2021.pdf>

Safe preparation, storage, and handling of powdered infant formula – guidelines:

<https://apps.who.int/iris/handle/10665/43659>

<https://www.enonline.net/attachments/93/pif.pdf>

<https://www.enonline.net/attachments/545/poster-preparing-formula-in-care-settings.pdf>

How to prepare for cup feeding at home:

<https://www.enonline.net/attachments/543/safe-prep-cup-feeding-leaflet.pdf>

If bottle feeding is necessary careful preparation and use is critical:

<https://www.enonline.net/attachments/542/safe-prep-bottle-feeding-leaflet.pdf>

For more information on the supporting infants dependent on breastmilk substitutes and the resources needed, please see: <https://www.enonline.net/ifecoregroupinfographicseries>

Infant Feeding in Emergencies Core Group, Infant Feeding in Emergencies Operational Guidance for emergency relief staff and programme managers Version 3.0 – October 2017, Emergency Nutrition Network, 2017.

<http://www.enonline.net/operationalguidance-v3-2017>

^{vi} The parts of the breast pump in contact with breastmilk need to be carefully cleaned after each use with water from a safe source. Where this cannot be done, hand expression is recommended. Please see standard breast pump guidelines: <https://www.cdc.gov/healthywater/hygiene/healthychildcare/infantfeeding/breastpump.html>

Appendix 3: Specific Resources for Ebola

1. Guidelines for the management of pregnant and breastfeeding women in the context of Ebola virus disease <https://apps.who.int/iris/bitstream/handle/10665/330851/9789240001381-eng.pdf>
2. Supporting non-breastfed children as part of an Ebola response https://www.enonline.net/attachments/3729/Supporting-non-breastfed-children-as-part-of-an-Ebola-response_26Nov2020.pdf

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