

# Maternal Vaccination and Breastfeeding

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QUESTIONS ABOUT THE USE of vaccines during breastfeeding are common. This column reviews the evidence and recommendations for administration of vaccines to nursing mothers. References and more detail can be found in LactMed® and at the Centers for Disease Control and Prevention (CDC) website.<sup>1</sup>

## Breastfeeding and Infant Response

Theoretically, high titers of immunoglobulins in breast milk might reduce the efficacy of the same vaccine administered to infants. Current evidence shows that when routine childhood vaccines are given according to accepted vaccination schedules, breastfeeding not only does not interfere with the infant's response to any vaccine, but also actually enhances infants' response to some vaccines. Breastfed infants are also less likely to have fever and may be less likely to experience anorexia and reduced energy intake after routine childhood immunization than those who are not breastfed.

## Live Attenuated and Inactivated

Vaccines come in two general types: inactivated vaccines that contain the antigens of the target organism, or live attenuated strains of the organism. Some inactivated vaccines are made using recombinant gene technology whereas others consist of killed disease organisms. There is no evidence or reason to believe that inactivated or recombinant vaccines would harm a nursing infant. Live attenuated vaccines given to the mother could conceivably infect the infant, but most live vaccines do not pass into milk or harm the infant. Two exceptions are yellow fever and smallpox vaccines, which can infect infants and should be avoided in nursing mothers.

## Routine Vaccines

### *Influenza*

The CDC and several health professional organizations state that breastfeeding is not a contraindication to either the live, attenuated (i.e., inhaled), or inactivated (i.e., injected) influenza vaccine, including H1N1 (swine) influenza vaccine. All adults should receive one dose annually. Breast milk antibody responses are higher with the inactivated influenza vaccine than with the live vaccine.

In a study of pregnant women who were immunized during the third trimester and breastfed their infants for an average of

14 weeks, their infants had a 36% reduction in respiratory illness with fever, and a 63% reduction in laboratory-confirmed influenza during the first 6 months of life compared with infants of mothers who received pneumococcal polysaccharide vaccine as a control. However, the relative contributions of breastfeeding and passive transfer of maternal antibodies during pregnancy were not determined.

A similar study conducted in Bangladesh found that influenza-specific IgA levels were higher in the breast milk of mothers immunized against influenza than in the milk of mothers immunized against pneumococcus. This difference lasted until at least 6 months postpartum. The breastfed infants of influenza-vaccinated mothers had fewer episodes of respiratory illness with fever in the first 6 months postpartum, which was positively correlated with the extent of exclusive breastfeeding.

### *Diphtheria, tetanus, and pertussis*

All components of this vaccine are inactivated. Adults should receive either the diphtheria, tetanus (Td) vaccine or the diphtheria, tetanus, acellular pertussis (Tdap) vaccine every 10 years. Women are recommended to receive Tdap with every pregnancy. Those vaccinated after 20 weeks of gestation have higher antipertussis immunoglobulin A (IgA) levels in their breast milk than those who are not vaccinated. Women, including nursing mothers, who have not received Tdap previously should be vaccinated with Tdap immediately postpartum.

A study of previously vaccinated infants found that at 21–40 months of age, breastfed infants had higher IgG levels against diphtheria, higher secretory IgA levels in saliva against diphtheria and tetanus, and higher fecal IgM against tetanus than formula-fed infants. After vaccination, antipertussis antibodies appear in breast milk within 1–2 weeks; however, conflicting results have been reported on whether breastfed infants are protected from pertussis by maternal vaccination.

### *Measles, mumps, and rubella*

The measles, mumps, and rubella (MMR) vaccine contains all live attenuated strains. No clear evidence exists of live attenuated measles or mumps vaccine virus excretion into breast milk. Numerous different strains of the rubella vaccine have been used over time and in different countries. Some strains have been found in breast milk and in throat

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swabs of the breastfed infants, including the RA 27/3 strain used in the United States. Cases of infection with the vaccine strain have been reported, but if an infection does occur, it is well tolerated because the virus is attenuated.

In one study, after immunization of their mothers with the RA 27/3 strain, 25% of breastfed infants showed transient seroconversion to rubella virus, but without any clinical disease. Another study examined a subset of 119 breastfed infants whose mothers received the RA 27/3 strain. None of them had any evidence of side effects or seroconversion from maternal vaccination at 2–8 months of age.

### *Varicella*

Varicella is a live vaccine indicated only for persons born in 1980 or later or in mothers who have no evidence of immunity. Mothers born before 1980 should usually receive the MMR vaccine. No studies have evaluated the effects of the combined measles, mumps, rubella, and varicella vaccine during breastfeeding. However, some information is available on varicella vaccine used alone. Two postpartum women immunized with varicella vaccine provided preimmunization and serial postimmunization breast milk samples. One sample of colostrum contained detectable viral DNA and B-actin, but all other samples were negative for these species. No varicella gene sequences were found in any of the samples. In another study of 12 women vaccinated with live attenuated varicella vaccine found no evidence of varicella virus excretion into breast milk.

### *Human papilloma virus*

This recombinant vaccine, which helps to prevent cervical cancer, is only recommended in women up to age 26 years. No information is available on the use of human papilloma virus vaccine during breastfeeding or its excretion into human milk. However, since the vaccine is not live, the risks to the breastfed infant are low.

## **Vaccines for Those with Risk Factors**

### *Hepatitis A*

Hepatitis A vaccine is indicated only in patients who wish the vaccine or in those with certain medical conditions, exposure risks, or travel in countries with endemic hepatitis A. No information is available on breastfeeding, but the vaccine is inactivated so the risk to the breastfed infant is low.

### *Hepatitis B*

Hepatitis B vaccine is a recombinant vaccine directed against hepatitis B surface antigen that is indicated only in patients who wish the vaccine, those with certain medical conditions, exposure risks, or who travel to countries with endemic hepatitis B. Breastfed infants of hepatitis B surface antigen positive mothers have a different response in the development of immunoglobulin subtypes after vaccination with hepatitis B vaccine than do formula-fed infants. However, breastfeeding does not interfere with the infant's overall antibody response to the hepatitis B vaccine, which is a routine infant vaccine.

### *Meningococcus*

Meningococcal vaccines are inactivated vaccines. Immunization of the mother during the third trimester of pregnancy markedly increases the amount of meningococcal antibodies in breast milk, including specific secretory IgA content. The vaccine is indicated in those who wish the vaccine, or with certain medical or exposure risks, and in previously unvaccinated first-year college students who live in residential housing. Breastfeeding is not a contraindication to the meningococcal vaccine.

### *Haemophilus*

*Haemophilus* vaccines are inactivated vaccines recommended only in adults with anatomical or functional asplenia, sickle cell disease, or hematopoietic stem cell transplant. Although there is some conflicting information on the effect of breastfeeding on infants' antibody response to *Haemophilus influenzae* type b vaccines, there is no evidence that breastfeeding reduces protection against the disease. Breastfeeding alone increases antibodies against *H. influenzae* and reduces the incidence of *H. influenzae* type b meningitis. Breastfeeding is not a contraindication to the *H. influenzae* vaccine.

### *Pneumococcus*

In general, only patients >65 years should receive the pneumococcal vaccine. However, smokers, those with certain chronic medical conditions, immunocompromised patients, and those with cerebrospinal fluid leak or cochlear implant can receive it at a younger age. Immunization of pregnant women with pneumococcal vaccine increases the specific secretory IgA content of colostrum and milk. The antibodies in colostrum help inhibit epithelial adhesion of pneumococci to infants' pharyngeal epithelial cells. Some evidence of decreased pneumococcal disease has been found among breastfed infants of vaccinated mothers. Infants who are breastfed for >90 days have a better antibody response to some pneumococcal strains in the vaccine at 13 months of age than those breastfed <90 days. Breastfeeding is not a contraindication to the pneumococcal vaccine.

## **Specialty Vaccines**

### *Adenovirus type 4 and type 7*

The adenovirus type 4 and type 7 vaccine is a live attenuated vaccine indicated only for military personnel between 17 and 50 years of age. No information is available on the use of adenovirus type 4 and type 7 vaccine during breastfeeding or its excretion into human milk. The CDC recommends against its use in nursing mothers, because live virus is shed for 28 days after vaccination.

### *Anthrax*

No data are available on the use of anthrax vaccine in nursing mothers. However, because it is an inactivated vaccine, breastfeeding is not a contraindication to the anthrax vaccine.

### *Cholera*

In the United States, cholera vaccine is a live attenuated oral vaccine indicated for travelers to high-risk areas. The oral cholera vaccine is not absorbed systemically; thus, maternal exposure to the vaccine is not expected to result in exposure of the breastfed infant to the vaccine. Administration of oral cholera vaccine to the mother decreased the risk of cholera in their breastfed infants by 47% in one study.

### *Yellow fever*

Yellow fever vaccine is a live attenuated vaccine. Encephalitis has been reported in breastfed newborns whose mothers received yellow fever vaccine, including one in which the vaccine strain was the verified pathogen. Administration of yellow fever vaccine to breastfeeding women should be avoided except in situations in which exposure to yellow fever cannot be avoided or postponed. Infants <6 months appear to be at an increased risk of encephalitis from the vaccine and should not be vaccinated. Infants >9 months of age should be vaccinated themselves if they will be traveling with their mother to a yellow fever endemic area.

### *Rabies*

Rabies vaccine is an inactivated vaccine. It may be given prophylactically to persons who routinely come into contact with animals. It is also given to anyone after exposure to potentially rabid animals. In the latter case, rabies immune globulin is also given. Breastfeeding is not contraindicated after administration of either of these products.

### *Smallpox*

The smallpox (vaccinia) vaccine is a live attenuated vaccine that is no longer given routinely, but is given to some military personnel. Smallpox vaccine has not been studied in lactating women. Live vaccinia virus can be inadvertently transmitted from a lactating mother to her breastfed infant. One 5-month-old breastfed infant acquired a vaccinia lesion on her upper lip, tongue, and cheek after her mother developed vaccinia lesions on both areolas. The mother's infection apparently originated from the father who had been vaccinated ~10 days prior. The exact mechanism of transmission was not apparent. The CDC recommends that nursing mothers not receive the smallpox vaccine. If a woman received smallpox vaccine during pregnancy or breastfeeding, she should avoid breastfeeding and handling any baby for at least

3–4 weeks until the vaccination scab has separated from the vaccination site. If the breasts are pumped to maintain the milk supply, the milk should be discarded.

### *Typhoid*

Typhoid vaccine is given to travelers to endemic areas, those in close contact with a carrier, or to laboratory workers who might come into contact with the organism. Both oral live attenuated and injectable inactivated typhoid vaccines are available. Breastfeeding is not a contraindication to either vaccine.

### *Japanese encephalitis*

No data exist on the safety or efficacy of Japanese encephalitis vaccine in breastfeeding women. However, the vaccine is inactivated so the risk to the breastfed infant is low.

### **Summary**

No routine vaccines are contraindicated in nursing mothers. Yellow fever vaccine should not be given to mothers who are breastfeeding an infant <9 months of age, unless it is absolutely unavoidable. Smallpox vaccine should not be given to nursing mothers.

### **Disclosure Statement**

No competing financial interests exist.

### **Reference**

- Centers for Disease Control and Prevention. recommended adult immunization schedule for ages 19 years or older, United States, 2019. Available at [https://www.cdc.gov/vaccines/schedules/hcp/imz/adult.html?CDC\\_AA\\_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvaccines%2Fschedules%2Fhcp%2Fadult.html#vacc-adult](https://www.cdc.gov/vaccines/schedules/hcp/imz/adult.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvaccines%2Fschedules%2Fhcp%2Fadult.html#vacc-adult) (accessed February 12, 2019).

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