



Diphtheria-Tetanus-Pertussis Vaccines

Revised: September 15, 2023.

Drug Levels and Effects

Summary of Use during Lactation

The Centers for Disease Control and Prevention and several health professional organizations state that vaccines given to a nursing mother do not affect the safety of breastfeeding for mothers or infants and that breastfeeding is not a contraindication to tetanus, diphtheria, and pertussis (Tdap) vaccine.[1-3] Women are recommended to receive Tdap with every pregnancy, which decreases the infant's risks of hospitalization and ICU admission, and results in shorter hospital stays than in infants whose mothers were not vaccinated. Anti-pertussis antibodies in human milk may contribute to the protection provided to the infant against pertussis infection.[4,5] Women vaccinated after 20 weeks of gestation have higher antipertussis IgA and IgG levels in their breastmilk than those who are not vaccinated. Women, including nursing mothers, who have not received acellular pertussis vaccine with Tdap previously should be vaccinated with Tdap immediately postpartum.[4,6] After vaccination, antipertussis antibodies appear in breastmilk within 1 to 2 weeks; however, conflicting results have been reported on whether breastfed infants are protected from pertussis.[7,8] Breastfeeding appears to reduce infant side effects associated with routine childhood immunization. Breastfed infants should be vaccinated according to the routine recommended schedules.

Drug Levels

Maternal Levels. Thirty-nine women who were within 24 hours postpartum received 0.5 mL of Tdap vaccine (Adacel, Sanofi Pasteur) and 11 received no vaccine. Colostrum or breast milk and blood samples were collected at baseline and 7, 10, 14, and 28 days after vaccination. Breastmilk IgA levels against pertussis toxoid peaked at day 10 postpartum, then slowly decreased. Breast milk antibody levels against the other antipertussis vaccine components, filamentous hemagglutinin and fimbriae types 2 and 3, reached a plateau during days 10 to 14 and then slowly decreased. Breast milk antibody levels against another antipertussis vaccine component, pertactin, peaked on day 14 and then decreased by day 28.[9]

The milk of 25 pregnant women given Tdap vaccine (Boostrix, GlaxoSmithKline) after 20 weeks of pregnancy was compared to colostrum from 12 unvaccinated women. Milk samples were collected prior to discharge after delivery (colostrum) and at 2, 4 and 8 weeks postpartum. Vaccinated women had significantly higher

Disclaimer: Information presented in this database is not meant as a substitute for professional judgment. You should consult your healthcare provider for breastfeeding advice related to your particular situation. The U.S. government does not warrant or assume any liability or responsibility for the accuracy or completeness of the information on this Site.

Attribution Statement: LactMed is a registered trademark of the U.S. Department of Health and Human Services.

antipertussis antibody levels in their breastmilk than unvaccinated women. The primary class of immunoglobulins was IgA, which were highest in colostrum, but still detectable at 8 weeks.[10]

Total and anti-pertussis toxin secretory IgA (sIgA) levels were measured in breastmilk from women who had been vaccinated either during pregnancy (n = 19), at or shortly after delivery (n = 34), less than 5 years before delivery (n = 9), or more than 5 years before delivery (n = 12). Tdap vaccine (Boostrix, GlaxoSmithKline) was used in the first 3 groups. Breastmilk samples were obtained between 44 and 91 days postpartum. No difference in total sIgA was found between the groups, but women who were vaccinated during pregnancy or shortly after birth had higher anti-pertussis toxin levels of sIgA than those vaccinated more than 5 years before. Higher anti-pertussis toxin sIgA levels were found among women practicing mixed feeding than among exclusively breastfeeding mothers.[11]

A study compared breastmilk antibody levels in mothers who were or were not vaccinated with Tdap (Boostrix, GSK) at 24 to 32 weeks of pregnancy. Results were also separated into those who delivered at term and those who delivered preterm. Blood and milk samples were collected in the first 72 hours postpartum, then at 4, 8 and 12 weeks postpartum. After preterm delivery, breastmilk contained antipertussis IgA and IgG levels comparable to those after term delivery. Milk after preterm delivery contained colostrum antipertussis IgA of 5.39 IU/mL compared with 6.69 IU/mL in mothers who delivered at term. Maternal vaccination during pregnancy induced higher antipertussis IgG levels in colostrum of vaccinated than in unvaccinated women delivering at term (0.110 IU/mL vs 0.027 IU/mL). Some women who were not vaccinated during pregnancy were vaccinated postpartum. In those women, antibody levels at 4 weeks postpartum were equal to those of women vaccinated during pregnancy. Antipertussis antibodies persisted until at least 12 weeks postpartum.[12]

Infant Levels. A study of 338 children in Greenland between 7.1 and 12.1 years old found the median concentrations of tetanus and diphtheria antibodies to be 0.92 and 0.07 IU/mL. Most (72%) of children had been breastfed at least 6 months, and only 7 children (2%) were never breastfed. Forty-two (12%) had tetanus concentrations below the protective limit and 175 (52%) had diphtheria concentrations below the limit. Exposure to marine environmental contaminants such as mercury, PCBs and perfluoro compounds were associated with markedly reduced odds of having diphtheria antibodies above the protective level.[13]

Effects in Breastfed Infants

Breastfeeding can enhance the response of the infant to certain vaccine antigens,[1,2,14] including tetanus toxoid and pertussis.[15,16] 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.[17,18]

A study in the United States of mothers who did not receive Tdap vaccine during pregnancy found that their infants who received breastmilk with 1 formula feeding or fewer daily decreased pertussis risk by about 75% compared with infants receiving more formula.[16]

One study of previously vaccinated infants found that at 21 to 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.[19]

A case-control study in Brazil found that exclusive breastfeeding of infants under 6 months of age protected them against pertussis-like illness. Protection was enhanced if the mother had been vaccinated against pertussis during pregnancy.[20]

Effects on Lactation and Breastmilk

Relevant published information was not found as of the revision date.

References

1. Ezeanolue E, Harriman K, Hunter P, et al. Best Practices Guidance of the Advisory Committee on Immunization Practices (ACIP). Available at: <https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html>
2. Kimberlin DW, Brady MT, Jackson MA, Long SS. Red Book: 2018 Report of the Committee on Infectious Diseases. 31st ed. Elk Grove Village, IL: American Academy of Pediatrics. 2018.
3. Gruslin A, Steben M, Halperin S, et al. Immunization in pregnancy: No. 220, December 2008. Int J Gynaecol Obstet 2009;105:187-91. PubMed PMID: 19367691.
4. Anon. Updated recommendations for use of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) in pregnant women--Advisory Committee on Immunization Practices (ACIP), 2012. MMWR Morb Mortal Wkly Rep 2013;62:131-5. PubMed PMID: 23425962.
5. Hunagund S, Golan Y, Asiodu IV, et al. Effects of vaccination against influenza, pertussis, and COVID-19 on human milk antibodies: Current evidence and implications for health equity. Front Immunol 2022;13:910383. PubMed PMID: 35903100.
6. Murphy TV, Slade BA, Broder KA, et al. Prevention of pertussis, tetanus and diphtheria among pregnant and postpartum women and their infants. Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2008;57 (RR-4):1-51.
7. Pandolfi E, Gesualdo F, Carloni E, et al. Does breastfeeding protect young infants from pertussis? Case-control study and immunologic evaluation. Pediatr Infect Dis J 2017;36:e48-e53. PubMed PMID: 27870812.
8. Bellido-Blasco J, Guiral-Rodrigo S, Míguez-Santiyán A, et al. A case-control study to assess the effectiveness of pertussis vaccination during pregnancy on newborns, Valencian community, Spain, 1 March 2015 to 29 February 2016. Euro Surveill 2017;22:30545. PubMed PMID: 28598324.
9. Halperin BA, Morris A, Mackinnon-Cameron D, et al. Kinetics of the antibody response to tetanus-diphtheria-acellular pertussis vaccine in women of childbearing age and postpartum women. Clin Infect Dis 2011;53:885-92. PubMed PMID: 21946190.
10. Abu Raya B, Sruogo I, Kessel A, et al. The induction of breast milk pertussis specific antibodies following gestational tetanus-diphtheria-acellular pertussis vaccination. Vaccine 2014;32:5632-7. PubMed PMID: 25148774.
11. De Schutter S, Maertens K, Baerts L, et al. Quantification of vaccine-induced antipertussis toxin secretory IgA antibodies in breast milk: Comparison of different vaccination strategies in women. Pediatr Infect Dis J 2015;34:e149-52. PubMed PMID: 25719454.
12. Orije MRP, Larivière Y, Herzog SA, et al. Breast milk antibody levels in Tdap vaccinated women after preterm delivery. Clin Infect Dis 2021;73:e1305-e1313. PubMed PMID: 33768227.
13. Timmermann CAG, Pedersen HS, Weihe P, et al. Concentrations of tetanus and diphtheria antibodies in vaccinated Greenlandic children aged 7-12 years exposed to marine pollutants, a cross sectional study. Environ Res 2021;203:111712. PubMed PMID: 34343554.
14. Pabst HF. Immunomodulation by breast-feeding. Pediatr Infect Dis J 1997;16:991-5. PubMed PMID: 9380478.
15. Perin MC, Schlindwein CF, de Moraes-Pinto MI, et al. Immune response to tetanus booster in infants aged 15 months born prematurely with very low birth weight. Vaccine 2012;30:6521-6. PubMed PMID: 22959983.
16. Curtis CR, Baughman AL, DeBolt C, et al. Risk factors associated with *Bordetella pertussis* among infants ≤ 4 months of age in the pre-Tdap era: United States, 2002-2005. Pediatr Infect Dis J 2017;36:726-35. PubMed PMID: 28033240.
17. Pisacane A, Continisio P, Palma O, et al. Breastfeeding and risk for fever after immunization. Pediatrics 2010;125:e1448-52. PubMed PMID: 20478932.

18. López-Alarcón M, Garza C, Habicht JP, et al. Breastfeeding attenuates reductions in energy intake induced by a mild immunologic stimulus represented by DPTH immunization: possible roles of interleukin-1beta, tumor necrosis factor-alpha and leptin. *J Nutr* 2002;132:1293-8. PubMed PMID: 12042449.
19. Hahn-Zoric M, Fulconis F, Minoli I, et al. Antibody responses to parenteral and oral vaccines are impaired by conventional and low protein formulas as compared to breast-feeding. *Acta Paediatr Scand* 1990;79:1137-42. PubMed PMID: 2085099.
20. Nascimento RMD, Baptista PN, Lopes KAM, et al. Protective effect of exclusive breastfeeding and effectiveness of maternal vaccination in reducing pertussis-like illness. *J Pediatr (Rio J)* 2021;97:500-7. PubMed PMID: 33465336.

Substance Identification

Substance Name

Diphtheria-Tetanus-Pertussis Vaccines

Drug Class

Breast Feeding

Lactation

Milk, Human

Vaccines