



## Influenza Vaccines

Revised: July 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 either the live, attenuated (i.e., inhaled) or inactivated (i.e., injected) influenza vaccine, including H1N1 (swine) influenza vaccine. Immunization of the mother during pregnancy increases the amount of influenza antibodies and influenza-specific CD8 T cells in breastmilk and may offer added protection of their breastfed infants against influenza.[1-3] Breastmilk antibody responses are similar or higher with the inactivated injectable influenza vaccine than with the live intranasal vaccine, but the intranasal vaccine induces transfer of numerous immune factors into milk that the injectable vaccine does not.[4,5] However, milk antibody titers are not markedly boosted by seasonal influenza vaccines.[6] Breastfed infants should be vaccinated according to the routine recommended schedules.[7-9]

#### Drug Levels

*Maternal Levels.* A randomized, double-blind study compared the effects of inactivated influenza vaccine (Fluzone, 2011-2012 strains) and live attenuated influenza vaccine (FluMist, 2012-2013 strains) in nursing mothers who were 28 to 120 days postpartum. A total of 248 women were included over two influenza seasons. No vaccine or wild-type influenza virus was detected in breastmilk of any of the women.[4]

Twenty-six nursing mothers collected milk samples just before and 2 weeks after receiving a seasonal influenza vaccine during the 2019-2020 and 2020-2021 flu seasons. Thirteen study participant milk sample pairs per influenza season were assessed for specific IgA, IgG, and secretory antibody (sAb) binding against each relevant HA strain included in either the 2019-2020 or 2020-2021 seasonal influenza vaccine. Across the 7 immunogens examined, as many as 54% of samples exhibited no sAb boost, and no significant differences were found in IgG- or IgA-mediated influenza neutralization activity between the prevaccination and post-vaccination timepoints. [6]

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

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## Effects in Breastfed Infants

Limited data indicate that breastfeeding can enhance the response of the infant to certain vaccine antigens. [7,9,10]

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. However, the contribution of breastfeeding compared with passive transfer of maternal antibodies during pregnancy was not determined.[11]

A prospective, blinded trial in Bangladesh compared outcomes of mothers randomly assigned to receive either trivalent influenza vaccine or pneumococcal polysaccharide vaccine in the third trimester of pregnancy and their infants. Influenza-specific IgA levels were higher in the breastmilk of those immunized against influenza than pneumococcus 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.[2]

A study compared the effects of inactivated influenza vaccine (Fluzone, 2011-2012 strains) and live attenuated influenza vaccine (FluMist, 2012-2013 strains) in nursing mothers who were 28 to 120 days postpartum. The breastfed infants whose mothers received the live attenuated strain had more fussiness (60%) than those whose mothers received the inactivated vaccine (45%).[4]

## Effects on Lactation and Breastmilk

A randomized, double-blind study compared the effects of inactivated influenza vaccine (Fluzone, 2011-2012 strains) and live attenuated influenza vaccine (FluMist, 2012-2013 strains) in nursing mothers who were 28 to 120 days postpartum. A total of 248 women were included over two influenza seasons. Breastmilk IgG and IgA (H1N1 strain only), serum hemagglutination inhibition (HAI), and serum IgG responses were higher after the inactivated vaccine than after the live oral vaccine.[4]

Maternal milk and infant gastric and stool samples were collected from 20 premature-delivering mother-infant pairs ranging in gestational age at birth from 26 to 36 weeks in the neonatal intensive care unit. Samples were collected at 8 to 9 days and 21 to 22 days postpartum. Results were compared to the same infant samples when the infants were given donor milk. Gastric samples were collected 30 minutes after the end of the feeding. IgA antibodies to H1N1 hemagglutinin and H3N2 neuraminidase were 3.6- and 2-fold higher, respectively, in maternal milk than donor milk feeds given at 8–9 days of postnatal age but did not differ at 21–22 days. IgM antibodies to H1N1 hemagglutinin (10- and 3-fold) and H3N2 neuraminidase-specific IgM (13- and 8-fold) were higher in maternal milk than in donor milk feeds given at 8–9 days and 21–22 days of postnatal age, respectively. H1N1 hemagglutinin-specific IgG was 2-fold higher in maternal than donor milk feeds given at 8–9 days and 21–22 days of postnatal age. H3N2 neuraminidase-specific IgG was 30% higher in maternal milk than donor milk feeds given at 8–9 days but did not differ at 21–22 days. In gastric contents, H1N1 hemagglutinin-specific IgG was 2-fold higher in maternal milk than donor feeds given at 8–9 days and 21–22 days of postnatal age. H3N2 neuraminidase-specific IgG was 30% higher in maternal milk than donor milk feeds given at 8–9 days but did not differ at 21–22 days.[12]

A study of nursing mothers compared the immune responses generated in milk after either live attenuated influenza vaccination or injectable inactivated influenza vaccination. Both vaccines induced influenza-specific IgA that persisted in milk for at least 6 months. Regulation of type I interferon production, toll-like receptor, and pattern recognition receptor signaling pathways were highly upregulated in milk on day 1 following live-attenuated vaccine but not by the inactivated vaccine at any time point.[5]

In a preliminary study, milk samples were obtained from 16 women, 8 of whom had received the 2019-2020 influenza vaccination (brands not specified) and the others had not. The women who had been vaccinated had greater expression of gene cell markers of T-cell surface markers.[13]

## References

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## Substance Identification

### Substance Name

Influenza Vaccines

### Drug Class

Breast Feeding

Lactation

Milk, Human

Vaccines