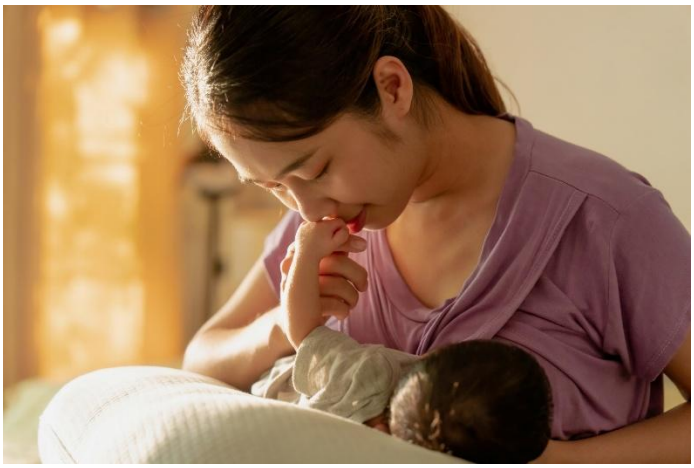
With Minimal Changes to Milk Composition Breastfeeding after COVID-19 Vaccination is Safe

A group of researchers investigated whether severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection or coronavirus disease 2019 (COVID-19) vaccination induces compositional changes in human milk, including the presence of vaccine components.



Study

Participants in this study were lactating individuals aged 18 years or older who either tested positive for SARS-CoV-2 or received a COVID-19 vaccine. Milk samples from vaccinated participants were included if they had no history of SARS-CoV-2 infection and were scheduled to receive the Pfizer, Moderna, or Johnson and Johnson (J&J) vaccines.

Milk was self-collected at specific intervals before and after vaccination using clean containers, with collection procedures approved by the Mount Sinai Hospital Institutional Review Board (IRB). For participants with SARS-CoV-2 infection, milk samples were collected within seven days of a confirmed positive test, with collection procedures approved by the University of Idaho IRB.

Milk samples were frozen immediately after collection, stored at -80°C, and analyzed using multi-omics approaches to examine proteins, metabolites, and lipids. The analysis employed advanced statistical methodologies, such as repeated measures analysis of variance (rANOVA) and pathway enrichment analyses, to identify significant changes in milk composition.

Protein, metabolite, and lipid extraction (MPLEx) procedures were employed to inactivate any pathogens and isolate biomolecules. Proteins were digested and labeled using tandem mass tag (TMT) isobaric labeling for proteomics analysis, while lipids and metabolites were analyzed using liquid chromatography-mass spectrometry (LC-MS/MS).

Results

Study participants ranged from 26 to 41 years old, with a mean age of 32 years, and were between less than one month to 30 months postpartum, with a mean of 8 months postpartum.

Milk samples were analyzed using multi-omics approaches, including proteomics, metabolomics, and lipidomics, after extraction via the MPLEx method. Significant compositional changes in milk proteins, metabolites, and lipids were identified in association with SARS-CoV-2 infection and compared to baseline control values. However, for COVID-19 vaccination, samples

were compared with prevaccine milk from the same participants, as no preinfection samples were available for those with SARS-CoV-2 infection.

SARS-CoV-2 infection was associated with significant alterations in 67 milk proteins within seven days of infection. These changes included 43 proteins with increased expression and 24 with decreased expression, primarily related to systemic inflammatory pathways. Specific pathways included NOD-like receptor signaling, JAK-STAT signaling, and responses to hepatitis C and influenza infections. Changes were also noted in lipid composition, with 385 lipid molecular species exhibiting differences.

Proinflammatory lipids, such as ceramides, were elevated, while anti-inflammatory lipids, like fatty acid esters of hydroxyl fatty acids, were reduced. Metabolomic analysis revealed 13 significantly altered metabolites, including ascorbic acid and its derivatives, and the anti-inflammatory drug acetaminophen.

In contrast, COVID-19 vaccination resulted in minimal changes to milk composition. No significant alterations were observed in milk lipidomics or metabolomics across any of the vaccine types evaluated. Proteomic changes varied by vaccine and timing.

The Moderna vaccine led to changes in eight proteins at 1-6 hours post-vaccination, while the J&J vaccine showed only one protein change in the same period. By day three, the J&J vaccine exhibited changes in 13 proteins, compared to two and four proteins for Moderna and Pfizer, respectively.

The J&J vaccine uniquely activated pathways such as NF-kappa B signaling and RIG-I-like receptor signaling, reflecting its design as an adenovirus-vectored vaccine. Proteomic pathway analysis revealed an overlap between the J&J vaccine and SARS-CoV-2 infection, primarily involving systemic inflammatory pathways, but vaccine-induced changes were less extensive than those from infection.

Investigations into the presence of vaccine components in milk found no detectable synthetic lipids or adenoviral proteins in any samples, indicating that vaccine components do not enter human milk.

Conclusion

To summarize, there is a global consensus that the risk of contracting COVID-19 via human milk feeding is negligible, while the benefits of breastfeeding during and after infection or vaccination are substantial. Vaccination effects on lactating individuals are mild, with no evidence of harm to infants consuming milk from vaccinated mothers. While trace amounts of vaccine messenger Ribonucleic acid (mRNA) have been detected in some milk samples, their physiological significance is unclear.

This study demonstrated significant milk composition changes following SARS-CoV-2 infection, including >65 altered proteins, 395 lipids, and 13 metabolites. In comparison, vaccination-induced changes in ≤13 proteins were predominantly transient and vaccine-specific, with no alterations in lipids or metabolites. No vaccine components were detected in milk, underscoring vaccine safety for lactating individuals.

These findings emphasize the importance of vaccination for protecting lactating individuals and their infants during pandemics.

Source:

https://www.news-medical.net/news/20241219/Breastfeeding-after-COVID-19-vaccination-is-safe-with-minimal-changes-to-milk-composition.aspx