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Breastfeeding is an essential complement to vaccination.

[Dòrea JG.](#)

Department of Nutrition, Universidade de Brasília, 70919-970 Brasília, DF, Brazil.
dorea@rudah.com.br

AIM: This article explores the role of breastfeeding in different aspects of vaccination in the first 6 months when infants are still developing: (1) pain management; (2) immunomodulation of infants' vaccine responses; (3) metabolism of thimerosal. METHODS: Major databases were searched for studies that addressed outcomes of related issues. RESULTS: Studies reveal that breastfeeding can: (1) help mothers and infants to cope with the stressful situations that accompany parenteral vaccines; (2) improve response to vaccines in the still maturing immunologic and enterohepatic systems of infants; (3) influence physiologic parameters that can change metabolism of ethylmercury derived from some vaccines. CONCLUSION: Health promotion that supports vaccinations should also emphasize early initiation and maintenance of exclusive breastfeeding up until 6 months for maximum protection of the infants with a possible beneficial effect on the vaccine response. Paediatric professionals should inform mothers of the proven benefits of breastfeeding and its importance in complementing vaccination and lowering stress and the risk of untoward reactions on susceptible infants.

[J Pediatr.](#) 1994 Apr;124(4):566-73.

Immunoglobulin A subclasses in infants' saliva and in saliva and milk from their mothers.

[Fitzsimmons SP](#), [Evans MK](#), [Pearce CL](#), [Sheridan MJ](#), [Wientzen R](#), [Cole MF](#).

Department of Microbiology, Georgetown University Medical Center, Washington, D.C.

We sought to determine (1) the ontogeny of secretory IgA subclasses in saliva of breast- and formula-fed infants and (2) the influence of breast-feeding on the maturation of secretory salivary IgA subclasses. Secretory IgA and subclasses 1 and 2 concentrations were determined in saliva from 40 healthy, term infants from birth to age 18 months, and in parallel milk samples from the infants' mothers who were breast-feeding during the first 6 months after birth. Secretory IgA was detected in the neonates' saliva as early as 3 days after birth, increased rapidly during the next 6 months, but then stabilized at a level approximately one-sixth that of the mothers' salivary secretory IgA. Secretory IgA2 represented less than 15% of secretory IgA in saliva collected 2 weeks after birth but by 6 months represented 24.4% of secretory IgA, a value approaching that of the mothers' salivary secretory IgA2 (30.4%). This increase in the proportion of secretory IgA2 was temporally related to a reduction in the proportion of secretory IgA2 in milk throughout lactation. The secretory IgA concentration increased more rapidly during the first 6 months after birth in infants exclusively breast fed than in those exclusively bottle fed. We conclude that although secretory immunity is immature in infants, breast-feeding may aid in protection against pathogenic microorganisms by increasing the rate of mucosal IgA maturation.

[Vaccine](#). 2003 Jul 28;21(24):3374-6.

Transfer of antibody via mother's milk.

[Van de Perre P.](#)

Laboratory of Bacteriology and Virology, University Hospital A. de Villeneuve and Mixed Research Unit 145 (UMR 145), Institute for Research and Development (IRD) and University of Montpellier 1, Montpellier, France.

Differing from humans, IgG from breast milk in many animal species (rodents, bovines, cats, ferrets, etc.) are transported across the intestinal epithelium into the neonatal circulation. This transport is located at the duodenal and jejunal level where enterocytes express a surface membrane receptor able to bind Fc of IgG and to facilitate transcytosis of these immunoglobulins. Fc γ -R, which is very similar to the placenta receptor responsible for active transplacental transfer of IgG in humans,

binds IgG but not other isotypes. Maternal milk antibodies represent an important part of circulating IgG in these animals, as they are involved in the negative feedback of endogenous IgG synthesis. This phenomenon stops abruptly as soon as weaning takes place. Neonatal calves that have a defect in such transfer of maternal immunoglobulins are at high risk of systemic infectious diseases. In humans, in whom gut closure occurs precociously, breast milk antibodies do not enter neonatal/infant circulation. A large part of immunoglobulins excreted in milk are IgA that protect mainly against enteric infections. The specificity of maternal milk IgA is driven by an entero-mammary cell circulation. Human milk also contains anti-idiotypic antibodies capable of enhancing infant antibody response. Maternal milk antibodies coat infant mucosal surfaces and some have a clear protective role. This has been studied extensively in infectious disease models such as rotavirus, E. coli, poliovirus, and retroviruses. In the rotavirus model, antirotaviral IgA can be detected in stools of breast-fed but not bottle-fed neonates. In a large cohort of lactating women infected with HIV-1 in Rwanda, anti-HIV milk antibodies of the IgG isotype were more frequently detected followed by secretory IgM. Surprisingly, anti-HIV-1 SIgA were less frequently found. The presence of milk SIgA at 15 days as well as the persistence of a SIgM response during the whole lactation period was associated with lower risk of HIV transmission from the mother to the infant. Recently, HIV-1 antibodies from maternal milk have been shown to block transcytosis in vitro in a monolayer enterocyte model. Among these antibodies, those directed against the ELDKWA epitope had higher neutralising activity than serum antibodies. In humans, milk excreted antibodies play a major role in protecting infants from infection by pathogens having a mucosal portal of entry.

[Int J Fertil Womens Med.](#) 2006 Sep-Oct;51(5):208-17.

Human breast milk immunology: a review.

[Paramasivam K](#), [Michie C](#), [Opara E](#), [Jewell AP](#).

School of Life Science, Kingston University Surrey, U.K.

Breast feeding has been shown to enhance the development of the immune system of the newborn as well as provide protection against enteric and respiratory infections. It has been suggested that implementation of breast feeding programs has the potential to save hundreds of thousands of lives worldwide. Human milk is a bodily fluid which, apart from being an excellent nutritional source for the growing infant, also contains a variety of immune components such as antibodies, growth factors, cytokines, antimicrobial compounds, and specific immune cells. These help to support the immature immune system of the newborn baby, and protect it against infectious risks during the postnatal period while its own immune system matures. This article reviews some of the factors in human breast milk that give it these important properties.

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Human milk-derived B cells: a highly activated switched memory cell population primed to secrete antibodies.

[Tuaille E](#), [Valea D](#), [Becquart P](#), [Al Tabaa Y](#), [Meda N](#), [Bollere K](#), [Van de Perre P](#), [Vendrell JP](#).

Unité de Recherche EA 4205, Université Montpellier 1, and Laboratoire de Virologie, Centre Hospitalier Universitaire de Montpellier, Montpellier, France.

While secretory Abs have been extensively explored in human breast milk, the existence, features, and functions of B lymphocytes remain largely unexplored in this compartment. We analyzed breast milk and blood lymphocytes from 21 lactating women, including 12 HIV-1-infected mothers. Breast milk B cells displayed a phenotype of class-switched memory B cells, with few IgD(+) memory and naive B cells. We observed that breast milk B lymphocytes bore a unique profile of adhesion molecules (CD44(+), CD62L(-), alpha(4)beta(7)(+/-), alpha(4)beta(1)(+)). Higher percentages of activated B cells (CD38(+)), large-sized B cells, plasmablasts, and plasma cells (CD19(+), CD20(low/-), CD27(high), CD138(+)) were found as compared with blood. This indicates that a significant proportion of breast milk B cells underwent terminal plasma cell differentiation. We also observed a higher frequency

of cells secreting Ig spontaneously in breast milk. Among these cells, IgG-secreting cells predominated over IgA-secreting cells as measured by Ig ELISPOT assays. Specific Ab-secreting cells were investigated following polyclonal activation using the CD40L ligation. Finally, the detection of anti-HIV-1-secreting cells demonstrates the existence of B cells specific to HIV-1 Ag in breast milk from HIV-1-infected women. Breast milk B cells display a phenotype strikingly different from blood, are primed to secrete Abs, and have a mucosal homing profile similar to B cells located in gut-associated lymphoid tissue.