

DOES BREASTFEEDING PREVENT ATOPIC DISORDERS?

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ABSTRACT

Conflicting study results on the role of breast-milk feeding have been reported in the literature. These diverging results may be related to the complex interaction between breast milk, the intestinal milieu, and the immune system of both baby and mother, as well as the environment. Breast-milk feeding remains the gold standard of infant nutrition during infancy. Although its role in the prevention of atopic disorders in children is still not conclusive, there is evidence that it may protect some infants against eczema and that prolonged breastfeeding may afford protection against asthma in younger children. There is a lack of evidence that maternal dietary restrictions during pregnancy and lactation play a significant role in the prevention of atopic disease in infants with the possible exception of atopic eczema. Exclusive breastfeeding for at least 4-6 months should be promoted. Health care workers should refrain from prescribing unsubstantiated dietary regimens during pregnancy and lactation to mothers with a history of atopy in their children as such diets could be harmful to both the mother and her baby.

Over the past few decades the incidence of atopic disorders such as atopic dermatitis, asthma and food allergies has increased among young children. A survey conducted a decade ago showed that 30-40% of children in Western societies suffer from atopic disorders such as eczema, asthma or allergic rhinitis.^{1,2}

Early exposure to different food proteins is most likely to be involved in the pathogenesis of allergy. Although Grulee and Sanford³ identified a significantly lower incidence of eczema in breastfed compared with cows'-milk-fed infants almost 70 years ago, the exact role of breast-milk feeding in atopic disorders is still not clear.

Some studies reported a protective effect of breastfeeding against allergies and asthma^{4,5} while in others no protective effect was noted.⁶ Bergman *et al.*⁷ and Sears *et al.*⁸ on the other hand found an association between breastfeeding and the development of atopic eczema or asthma.

These diverging study results may be due to the fact that not only is breast milk immunologically very complex, but also the interaction between breast-milk feeding, the intestinal milieu, and the immune system of both baby and mother, as well as the environment, is even more complex.⁹ There could also be genetic differences between patients which would influence whether breastfeeding protects against the development of allergies or sensitises the individual.¹⁰ Chung

*et al.*¹¹ feel that infection and psychosocial factors may also play a role.

THE ENTEROMAMMARY LINK

During pregnancy, microbes and antigens in the mother's gut are taken up by the M cells covering the Peyer's patches where they stimulate T and B lymphocyte production.¹² In late pregnancy these lymphocytes migrate to the mammary glands, a process known as 'homing', where they produce the IgA dimer J chains which become complete secretory IgA (s-IgA) antibodies.¹¹ These antibodies are directed against the microbes and antigens which pass through the mother's intestines. This is known as the enteromammary link.¹²

During birth and the direct contact with the mother's perineum, the newborn infant's gut is colonised with the mother's intestinal bacteria. The mother's colostrum and breast milk immediately provide the newborn infant with s-IgA and other anti-infective properties against her gut microflora with which the infant's gut has been colonised.¹² s-IgA, oligosaccharides and cytokines, etc. in breast milk have developed over thousands of generations to protect the infant against the invasion of microflora and other gastrointestinal allergens through the single epithelial layer of the gastrointestinal tract into the vascular bed of the intestine.¹³

Furthermore, the bifidus factor in breast milk promotes intestinal colonisation by means of lactobacilli and bifidobacteria and thereby stimulates T-helper 1 (Th1) cell responses which also protect against allergy in breastfed infants.¹⁴

ARE ANTIBIOTICS THE CULPRITS?

The inappropriate use of antibiotics in the breastfed infant may destroy lactobacilli in the infant's gut. Wickens *et al.*¹⁵ reported an association between the frequent use of antibiotics in young infants and an increased risk of developing asthma in later childhood. However, Celedon *et al.*¹⁶ found no association between antibiotic use during early infancy and asthma developing during childhood.

The use of probiotics may reduce the incidence of certain atopic diseases in breastfed infants.^{17,18} Kalliomaki *et al.*¹⁷ administered probiotics or lactobacilli to mothers during the last 4 weeks of pregnancy and during lactation. They noted a decreased incidence of atopic dermatitis without a decrease in total serum or food-specific IgE in their infants.¹⁷ Rautava *et al.*¹⁸ noted an increase in transforming growth factor beta-2 (TGF- β 2) levels in breast milk of the mothers supplemented with probiotics. However, there is currently not enough evidence to support the routine supplementation of probiotics to pregnant and lactating women.¹⁹

TRANSFERRING IMMUNOLOGICAL INFORMATION

Human milk provides the baby with large quantities of granulocytes, macrophages and lymphocytes, as well as epithelial cells, during early lactation.²⁰⁻²² The maternal T and B lymphocytes in breast milk are taken up in the gut of the baby. In this way immunological information is transferred from the mother to her baby.²⁰⁻²²

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Because of the enteromammary link between the mother and her baby through breast milk, cows' milk protein, egg or peanut allergens may be transferred to the infant.^{23,24} Egg and wheat allergens have been detected in breast milk as soon as 2-6 hours after maternal intake and were still detectable up to 4 days after intake.^{25,26} However, it remains uncertain whether these antigens can lead to sensitisation or tolerance.¹⁹ Lack *et al.*²⁷ showed no association between maternal intake of peanuts during pregnancy and peanut allergy in the child. Neither has antigen avoidance during pregnancy and lactation been shown to be beneficial in preventing atopic disease in the breastfed infant.²⁸ These allergy-avoidance diets could even have undesirable effects on maternal or fetal nutrition.²⁸ According to the Committee on Nutrition, Allergy and Immunology of the American Academy of Pediatrics there is currently lack of evidence that maternal dietary restrictions during pregnancy play a significant role in the prevention of atopic disease in infants.²⁹ Similarly, antigen avoidance during lactation does not prevent atopic disease, with the possible exception of atopic eczema, although more data are needed to substantiate this conclusion.²⁹ Despite these recommendations, Wilson *et al.*³⁰ reported that allergists compared with non-allergists are more likely to recommend a diet regimen during pregnancy (77% vs 35%) and lactation (91% vs 73%) and the withholding of solids until the age of 6 months (89% vs 70%). They concluded that more education of health care workers is needed in this regard.³⁰

Breast milk contains numerous cytokines such as interleukin (IL) IL-1 β , IL-4, IL-5, IL-6, IL-10, tumour necrosis factor- α (TNF- α) and TNF- β .^{31,32} Components of breast milk such as TGF- β , soluble CD14, eicosapentaenoic, docosapentaenoic acid and s-IgA to ovalbumin may be protective against the development of allergies, while others such as IL-4, IL-5, IL-6, arachidonic acid, etc., may induce allergies.¹⁹ Duchen *et al.*³³ showed that a high arachidonic acid to eicosapentaenoic acid ratio in breast milk could be associated with a higher risk of atopy in the infant while Casas *et al.*³⁴ showed that low levels of s-IgA in breast milk are associated with an increased risk of cow's milk allergy in infants. Duchen *et al.*³³ reported lower levels of s-IgA to ovalbumin in breast milk of mothers with allergy compared with mothers without allergy. Cytokines IL-4, IL-5, and IL-13, which are closely involved with IgE and eosinophil induction, are present in higher concentrations in the breast milk of atopic mothers compared with mothers without allergy³¹ while the levels of TGF- β 1 and TGF- β 2 which are thought to protect against the development of atopy are not increased in these mothers.³³

DURATION OF BREASTFEEDING

The duration of breastfeeding may also impact on the incidence of atopic disease in infants. In a multidisciplinary review Van Odiijk *et al.*³⁵ concluded that breastfeeding reduces the risk for asthma and that the protective effects increase with the length of the breastfeeding period. Kull *et al.*³⁶ and Larsson *et al.*² showed a significant reduction in wheezing and atopic dermatitis at the age of 2 years in infants who were breastfed for $\pm$ 4 months compared with <4 months. Oddy *et al.*⁴ also showed that the incidence of wheezing was higher and that asthma was diagnosed at a younger age if exclusive breastfeeding was continued for <4 months compared with those infants who were breastfed for >4 months. The American Academy of Pediatrics therefore supports exclusive breastfeeding for the first 6 months of life³⁷ while the European Society for Paediatric Gastro-enterology, Hepatology and Nutrition

recommends 4-6 months.³⁸ The Committee on Nutrition, Allergy and Immunology of the American Academy of Pediatrics recommends that for infants at high risk of developing atopic disease, there is evidence that exclusive breastfeeding for at least 4 months compared with feeding intact cow's milk protein formula decreases the cumulative incidence of atopic dermatitis and cow's milk allergy in the first 2 years of life.²⁹ They further recommend that exclusive breastfeeding for at least 3 months protects against wheezing in early life but that in infants at risk of developing atopic disease, the current evidence that exclusive breastfeeding protects against allergic asthma occurring beyond 6 years of age is not convincing.²⁹ They also state that solid foods should not be introduced before 4-6 months of age but there is no current convincing evidence that delaying their introduction beyond this period has a significant protective effect on the development of atopic disease regardless of whether infants are fed cow's milk protein formula or human milk.²⁹ This includes delaying the introduction of foods that are considered to be highly allergenic such as fish, eggs, and foods containing peanut protein.²⁹ For infants older than 4-6 months of age, there are insufficient data to support a protective effect of any dietary intervention for the development of atopic disease.²⁹

CONCLUSIONS

Breast-milk feeding remains the gold standard of infant nutrition during infancy and although its role in the prevention of atopic disorders in children is still not conclusive there is evidence that it may protect some infants against eczema and that prolonged breastfeeding may afford protection against asthma.²⁹ In the future a better understanding of genetic factors may eventually allow for better predictability of the role of breast-milk feeding in atopy. More studies are required to determine the specific effect of the complex interaction of immunomodulatory factors in breast milk between mother and infant in the development of allergy.³⁸

Because of the high incidence of atopic disorders it is essential that health care workers involved in the care of children familiarise themselves with the role of breast-milk feeding and the pathogenesis of atopic disease. Exclusive breastfeeding for at least 4-6 months should be promoted and health care workers should refrain from prescribing unsubstantiated dietary regimens during pregnancy and lactation to mothers with a history of atopy in their children.²⁹ Such diets could be harmful to the mother and her baby.

Declaration of conflict of interest

The author declares no conflict of interest.

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