Modulating Breast Milk Composition – The Key to Allergy Prevention?

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Allergic diseases such as asthma, eczema, hay fever and food allergy are the most common chronic diseases of childhood in many countries, and there is evidence that early life microbial exposure may be important in their development. The use of probiotic bacteria for preventing allergic disease has been tested in several randomised controlled trials and appears to be effective in preventing eczema but not allergic sensitisation [1]. The translation of this finding into clinical practice is hampered by the heterogeneity of interventions used in the trials and our limited understanding of how probiotics might work in this context. There is evidence that probiotic administration to pregnant and lactating women alters breast milk immune composition [2–4]. Although the specific changes identified are not always correlated with clinical outcomes, maternal probiotic supplementation during pregnancy and lactation can prevent eczema, and modulation of breast milk composition is the most likely mechanism [5]. The possibility that interventions which modify maternal immunity can impact infant immune responses by changing breast milk composition is supported by associations between breast milk composition and allergic outcomes [6, 7]. Variations in breast milk immune composition (and in infant response to breast milk immune constituents) may also explain some of the conflicting results of studies evaluating whether pro-

longed exclusive breastfeeding can prevent allergic disease [8, 9]. There are over 250 proteins in human breast milk including a wide variety of cytokines, inflammatory mediators, signalling molecules and soluble receptors [10], yet there is limited literature on the relationship between maternal diet, breast milk immune constituents and allergy development.

In this issue of *International Archives of Allergy and Immunology*, Kuitunen et al. [11] have investigated a potential role for IgA antibodies in breast milk as a mechanism through which probiotics prevent eczema. The study is well designed to answer this question, undertaken as part of a large probiotic/prebiotic intervention trial, on both colostrum and mature breast milk samples using appropriate methodology. The focus on IgA antibodies is justified by the established role of IgA of breast milk origin in gut mucosal immunity [12]. Kuitunen et al. [11] found no difference in total IgA concentration between treatment groups in contrast to others who found either increased [2] or decreased [3] IgA levels in breast milk from mothers treated with probiotics. Their findings with respect to food-specific IgA antibodies were mixed – for example high ovalbumin IgA in colostrum was associated with atopy by age 2 years – but low levels in mature breast milk were associated with eczema. Previous studies found probiotics alter levels of TGF- β_1 or

TGF- β_2 in breast milk [2–4]. In the trial of Kuitinen et al. [11] probiotics increased the TGF- β_2 level in mature breast milk, but this was in turn associated with increased odds for allergic disease or eczema development by age 2 years (but not age 5 years).

Overall, these data add to a confusing picture from studies of breast milk immune constituents in relation to maternal probiotic supplementation or allergy outcomes. In view of the large number of potentially immunoactive constituents in breast milk, we may be missing an opportunity by limiting our studies to the investigation of a limited range of cytokines and antibodies. Future re-

search needs to expand on the differences found in breast milk composition of women with different environmental exposures [13, 14] and to use modern systematic methodologies to characterise variations in breast milk composition in relation to well-defined clinical and immune outcomes during childhood [15]. Understanding the relationship between breast milk composition and allergy development in children may allow us to establish a new paradigm in allergy prevention research – namely the modulation of breast milk composition via maternal dietary interventions – in order to promote healthy infant immune development.

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