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Breast milk polyunsaturated fatty acid composition and infant atopic diseases in the Canadian Healthy Infant Longitudinal Development (CHILD) Study

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Background:

Conflicting evidence suggests that allergic disease development may be influenced by n-3 and n-6 long-chain polyunsaturated fatty acids (LC-PUFAs), which are naturally found in breast milk but vary greatly between mothers.

Objective:

We examined the associations of breast milk LC-PUFAs with food sensitization and atopic dermatitis at 1 year of age.

Methods:

An atopy-enriched subsample of 1109 mother-infant dyads was selected from the CHILD cohort. Breast milk fatty acids collected at 3-4 months postpartum were analyzed by high-resolution capillary gas-liquid chromatography, including the n-3 LC-PUFAs eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), and the n-6 LC-PUFA arachidonic acid (ARA). At 1 year, food sensitization was defined by skin-prick testing for egg, peanut, cow's milk, and soybean, and atopic dermatitis was diagnosed by trained healthcare professionals. Associations were determined by logistic regression with adjustment for lactation stage, maternal ethnicity, exclusivity of breastfeeding, and other potential confounders.

Results:

In our study population, 184 (16.6%) infants were sensitized to food allergens and 160 (14.4%) were diagnosed with atopic dermatitis. A higher ratio of ARA/(DHA+EPA) was associated with lower odds of food sensitization (11% vs. 22% for the top vs. bottom quintile, $p=0.001$). This association was stronger in females (per quintile increase: aOR 0.78 [95% CI 0.63, 0.97]) than in males (aOR 1.04 [95% CI 0.87, 1.24]) (p for sex interaction: 0.07). Similar patterns of association were observed for atopic dermatitis. Neither condition was significantly associated with individual LC-PUFA levels in adjusted models.

Conclusion:

Ratios of LC-PUFAs appear to be more clinically relevant than individual LC-PUFA levels. Specifically, our results suggest that a higher ratio of ARA/(DHA+EPA) in breast milk may reduce the risk of allergic conditions, especially in female infants. Further research is needed to determine the underlying mechanisms for this sex-specific association.