Reduced diversity of the intestinal microbiota during infancy is associated with increased risk of allergic disease at school age.


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Abstract

BACKGROUND:
Changes in the human microbiome have been suggested as a risk factor for a number of lifestyle-related disorders, such as atopic diseases, possibly through a modifying influence on immune maturation in infancy.

OBJECTIVES:
We aimed to explore the association between neonatal fecal flora and the development of atopic disorders until age 6 years, hypothesizing that the diversity of the intestinal microbiota influences disease development.

METHODS:
We studied the intestinal microbiota in infants in the Copenhagen Prospective Study on Asthma in Childhood, a clinical study of a birth cohort of 411 high-risk children followed for 6 years by clinical assessments at 6-month intervals, as well as at acute symptom exacerbations. Bacterial flora was analyzed at 1 and 12 months of age by using molecular techniques based on 16S rRNA PCR combined with denaturing gradient gel electrophoresis, as well as conventional culturing. The main outcome measures were the development of allergic sensitization (skin test and specific serum IgE), allergic rhinitis, peripheral blood eosinophil counts, asthma, and atopic dermatitis during the first 6 years of life.

RESULTS:
We found that bacterial diversity in the early intestinal flora 1 and 12 months after birth was inversely associated with the risk of allergic sensitization (serum specific IgE $P = .003$; skin prick test $P = .017$), peripheral blood eosinophils ($P = .034$), and allergic rhinitis ($P = .007$). There was no association with the development of asthma or atopic dermatitis.

CONCLUSIONS:
Reduced bacterial diversity of the infant's intestinal flora was associated with increased risk of allergic sensitization, allergic rhinitis, and peripheral blood eosinophilia, but not asthma or atopic dermatitis, in the first 6 years of life. These results support the general hypothesis that an imbalance in the intestinal microbiome is influencing the development of lifestyle-related disorders, such as allergic disease.