Low Gut Microbiota Diversity in Early Infancy Precedes Asthma at School Age

PURPOSE OF THE STUDY. To assess diversity and characterize stool bacteria during the first year of life in relation to the prevalence of allergic disease in school-age children.

STUDY POPULATION. The children in the current study are a subset of a larger study of infants with a family history of allergic disease conducted in Sweden between 2001 and 2005. Study participants received either Lactobacillus reuteri ATCC 55730 or placebo daily from day 1 to 3 of life until 12 months of age. Stool samples were collected at ages 5 to 7 days, 1 month, and 12 months. At 2 years of age, 20 children with immunoglobulin E (IgE)-associated eczema and stool samples available from all 3 sampling occasions, as well as 28 randomly selected children without allergic manifestations, were identified for 7-year follow-up. Forty-seven of the planned 48 children were breastfed for at least 1 month, and no children received antibiotics before the probiotic group, and 30 belonged to the placebo group. The patient who dropped out did not have allergic manifestations at 2 years. All children were breastfed for at least 1 month, and no children received antibiotics before 1 month of age. Data on gender, birth order, method of delivery, family history of allergic disease, breastfeeding, pets in the home, antibiotic use, probiotic supplementation, and infection history during the first 2 years of life were gathered for each patient.

METHODS. Stool microbial diversity and composition was analyzed with 16S rDNA 454 pyrosequencing. Clinical evaluation at 7 years of age included structured interviews related to allergic disease, physical examination, spirometry, measurement of fractional exhaled nitric oxide, and skin prick testing with egg white, milk, cat, dog, Birch, peanut, mite, and timothy extracts.

RESULTS. Children who developed asthma (n = 8) had lower diversity of the total stool microbiota than non-asthmatic children at 1 week (P = .04) and 1 month (P = .003) of age. Asthma was not associated with total stool microbiota diversity at 12 months. There was not a consistent association between asthma at 7 years and the diversity of different stool bacterial phyla at any age. Allergic rhinoconjunctivitis, skin prick test reactivity, eczema, and IgE-associated eczema at 7 years were not associated with stool microbiota diversity during the first year of life.

CONCLUSIONS. Low intestinal microbial diversity during the first month of life is associated with increased risk of asthma, but not allergic rhinoconjunctivitis, skin prick test reactivity, or eczema in children at 7 years of age. Factors that affect gut microbial colonization in infancy may also affect asthma development in childhood.

Infant Wheeze, Comorbidities and School Age Asthma

PURPOSE OF THE STUDY. To identify clinical risk factors for asthma at 8 years of age in children with a history of infant wheeze.

STUDY POPULATION. From a population-based birth cohort of 4089 children born in Stockholm, Sweden, between 1994 and 1996, this analysis included 3251 (80%) who had data at ages 1, 2, and 8 related to wheeze, eczema, rhinorrhea, and asthma.

METHODS. Data were collected by questionnaires distributed at 1, 2, 4, and 8 years of age. Infant wheeze was defined as ≥1 episodes of wheezing or whistling breathing sounds before age 2. Asthma at age 8 was defined as ≥4 wheezing episodes in the past 12 months or 1 wheezing episode in the past 12 months with either regular or intermittent use of inhaled corticosteroids.

RESULTS. Eight hundred twenty-three children (25%) in the analysis population met criteria for infant wheeze; 116 (14%) of infant wheezers had asthma at age 8, compared with 90 (4%) of infant nonwheezers. Among infants who wheezed, family history of atopy (adjusted odds ratio 1.53, 95% confidence interval 1.02–2.30), ≥3 episodes of wheeze (3.41, 2.09–5.56), wheezing that persisted through the first and second year (5.11, 2.51–10.41), use of inhaled corticosteroids (3.42, 2.20–5.32), and infant eczema (2.31, 1.52–3.49) were independent risk factors for asthma at age 8. Abdominal pain was also an independent risk factor for asthma at age 8; however, the potential mechanism for this finding was unclear. For infants who wheezed, having multiple risk factors was associated with an additional increase in the odds of having asthma at age 8.

CONCLUSIONS. Although infants who wheezed had an increased risk of asthma at school age compared with
Association of Improved Air Quality With Lung Development in Children


STUDY POPULATION. Children 11 to 15 years of age living in Southern California communities.

METHODS. There were 2120 children enrolled in 12 Southern California communities, and analysis was done from 5 communities where consistent results were obtained in all 3 cohorts. Linear regression models were used to examine the relationship between declining pollution levels over time and lung function development from 11 to 15 years of age.

RESULTS. Over the 13 years, improvement in 4-year growth in both forced expiratory volume in 1 second and forced vital capacity were associated with concurrent decline in levels of nitrogen dioxide and a particulate matter of aerodynamic size <2.5 microns and also for particles <10 microns. The portion of children with low forced expiratory volume in 1 second (<80% predicted) at 15 years of age declined significantly from 7.9% to 6.3% and then 3.6% across the three periods. There was no difference in females or males and in patients with or without asthma.

CONCLUSIONS. Long-term improvement in air quality was associated statistically and clinically with significant positive effect on lung function and lung growth in children.

REVIEWER COMMENTS. These data are a major public health statement of the salutary benefits for our efforts to improve air quality. A higher level of lung function in early adulthood decreases the effect of chronic respiratory conditions and also decreases premature death of all causations.

URL: www.pediatrics.org/cgi/doi/10.1542/peds.2015–2776U

Torie Grant, MD
Elizabeth Matsui, MD, MHS
Baltimore, MD

The Influence of Childhood Traffic-Related Air Pollution Exposure on Asthma, Allergy and Sensitization: A Systematic Review and a Meta-analysis of Birth Cohort Studies


PURPOSE OF THE STUDY. To summarize the literature on the effect of childhood exposure to traffic-related air pollution (TRAP) on the development of asthma and allergies.

STUDY POPULATION. Birth cohort studies that examined the association between TRAP exposure in early childhood and development of respiratory or allergic outcomes.

METHODS. Medline, Embase, and ISI Web of Science databases were searched using key words related to TRAP and respiratory or allergic outcomes and data were extracted using a standardized form. Only English-language studies were considered. Meta-analysis was done to analyze the association between exposures to various components of traffic, including PM2.5, NO2, and “black carbon” and the outcomes of asthma incidence and allergic sensitization separately. Analyses were further stratified by the age at which asthma incidence was measured.

RESULTS. Nineteen articles describing 11 birth cohorts fit the inclusion criteria. Increased exposure to NO2, PM2.5, and black carbon showed significant associations with increased asthma incidence, especially at younger ages, but there was substantial variability between studies, particularly for the studies of NO2 and PM2.5. Increased exposure to NO2 and PM2.5 was also associated with increased risk of sensitization to outdoor, but not indoor, Aeroallergens, again with substantial variability between studies. Meta-analysis of the association between TRAP and hay fever, eczema, or wheeze could not be performed.

CONCLUSIONS. Increased exposure to TRAP was found to be associated with increased risk of incident asthma and allergic disease, but substantial heterogeneity was found between studies. The authors call for more large, long-term studies investigating the effects of age of exposure on these outcomes and looking at long-term outcomes.

REVIEWER COMMENTS. Traffic-related air pollution is a known risk factor for asthma and allergic diseases, and this study
Infant Wheeze, Comorbidities and School Age Asthma
Torie Grant and Elizabeth Matsui
Pediatrics 2015;136;S232
DOI: 10.1542/peds.2015-2776U

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://pediatrics.aappublications.org/content/136/Supplement_3/S232.2