Allergic disease and sensitization in Steiner school children

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Background: The anthroposophic lifestyle has several features of interest in relation to allergy: for example, a restrictive use of antibiotics and certain vaccinations. In a previous Swedish study, Steiner school children (who often have an anthroposophic lifestyle) showed a reduced risk of atopy, but specific protective factors could not be identified.
Objective: To investigate factors that may contribute to the lower risk of allergy among Steiner school children.
Methods: Cross-sectional multicenter study including 6630 children age 5 to 13 years (4606 from Steiner schools and 2024 from reference schools) in 5 European countries.

Results: The prevalence of several studied outcomes was lower in Steiner school children than in the reference group. Overall, there were statistically significant reduced risks for rhinoconjunctivitis, atopic eczema, and atopic sensitization (allergen-specific IgE ≥0.35 kU/L), with some heterogeneity between the countries. Focusing on doctor-diagnosed disease, use of antibiotics during first year of life was associated with increased risks of rhinoconjunctivitis (odds ratio [OR], 1.97; 95% CI, 1.26-3.08), asthma (OR, 2.79; 95% CI, 2.03-3.83), and atopic eczema (OR, 1.63; 95% CI, 1.22-2.17). Early use of antipyretics was related to an increased risk of asthma (OR, 1.54; 95% CI, 1.11-2.13) and atopic eczema (OR, 1.32; 95% CI, 1.02-1.71). Children having received measles, mumps, and rubella vaccination showed an increased risk of rhinoconjunctivitis, whereas measles infection was associated with a lower risk of IgE-mediated eczema.
Conclusion: Certain features of the anthroposophic lifestyle, such as restrictive use of antibiotics and antipyretics, are associated with a reduced risk of allergic disease in children. (J Allergy Clin Immunol 2006;117:59-66.)

Key words: *Allergy, anthroposophic lifestyle, antibiotics, antipyretics, asthma, biodynamic diet, measles, sensitization, vaccination*

The prevalence of IgE-mediated allergic diseases has increased markedly during the past decades, especially in children,[1,2] although recent reports indicate that the occurrence has stabilized.[3] The causes behind these trends are largely unknown. Factors increasing the risk have received the greatest attention, but in recent years, attention has also focused on possible protective factors, such as living on a farm[4] and specific probiotic strains.[5] To identify protective factors, it is of interest to study groups in the population with a low prevalence of allergy, such as children from anthroposophic families.[6] The anthroposophic lifestyle includes factors like a restrictive use of antibiotics, antipyretics, and vaccinations, and often a biodynamic diet.[6] An earlier study was conducted in a limited community of anthroposophic families, showing a lower prevalence of childhood allergy,[6] but specific protective factors could not be identified.

The aim of this study was to identify possible protective factors for allergy associated with the anthroposophic lifestyle. The study subjects include school children from Steiner schools, who often come from anthroposophic

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Abbreviations used
MMR: Measles, mumps, and rubella
OR: Odds ratio
PARSIFAL: Prevention of Allergy—Risk Factors for Sensitization Related to Farming and Anthroposophic Lifestyle

families, and reference children in 5 European countries, constituting the largest and most coherent study ever performed in this group of children.

METHODS

This work is based on the Prevention of Allergy—Risk Factors for Sensitization Related to Farming and Anthroposophic Lifestyle (PARSIFAL) study, a cross-sectional, multicenter study performed in 5 European countries among children age 5 to 13 years. The design has been described in detail elsewhere.[7] This report focuses on children attending Steiner schools, as well as referents from non-Steiner schools in similar regions. Information about environmental exposures, history of infections, diet, animal contact, anthroposophic lifestyle, and symptoms and diagnoses of allergic diseases was collected through a parental questionnaire. Most of the questions were based on the internationally standardized and validated International Study of Asthma and Allergies in Childhood (ISAAC) phase II protocol,[8] or derived from the earlier Swedish study on anthroposophic children.[6] The fieldwork was performed between October 2000 and May 2002 during overlapping periods in the different countries. The study was approved by local ethics committees in all centers.

A venous blood sample was obtained from children with a completed questionnaire and parental consent. Because of a large number of children included in the questionnaire surveys in Germany and Switzerland, a random sample of eligible children was selected in these countries. In Germany, only Steiner school children whose parents expressed an anthroposophic lifestyle were chosen for blood sampling. Sera were stored at −20°C before analysis. Allergen-specific IgE was measured against a mixture of common inhalant (Phadiatop) and food (fx5) allergens (Pharmacia CAP System; Pharmacia Diagnostics AB, Uppsala, Sweden). All IgE analyses were performed at the Department of Clinical Immunology at the Karolinska University Hospital, Stockholm, Sweden.

All health outcomes were reported by the parents, except sensitization, which was assessed from blood sampling. Current rhinoconjunctivitis symptoms were defined as sneezing, runny nose, nasal block-up, and itchy eyes in the child during the last 12 months without having a cold at the same time. Children diagnosed with hay fever and who ever had symptoms of hay fever were considered to have a doctor's diagnosis of rhinoconjunctivitis. Current wheezing was defined as having wheezing at least once during the last 12 months. Children ever diagnosed with asthma, or obstructive bronchitis more than once, were considered to have doctor's diagnosis of asthma. Current atopic eczema symptoms were present if the child ever had had an itchy rash intermittently for at least 6 months, and if the child had had this rash at any time during the last 12 months. Children with an intermittent itchy rash for at least 6 months and who had ever been diagnosed with atopic eczema were considered to have a doctor's diagnosis of atopic eczema. Atopic sensitization was indicated if the child had at least 1 allergen-specific IgE result of ≥0.35 kU/L against common inhalant and/or food allergens. To achieve a stricter definition of allergic disease, some analyses were performed combining the symptom or doctor's diagnosis–based outcomes with IgE sensitization.[9]

The relation between factors associated with the anthroposophic lifestyle and health outcomes was estimated by using odds ratios (ORs) and 95% CI, computed from logistic regression. Statistical significance was calculated by the Pearson χ^2 test statistic and defined as a P value $\leq .05$. Data were analyzed by using Stata 8.0 software (Stata Corp LP, Collage Station, Tex) and explored in models including only demographic variables—age, sex, and country (crude analysis)—as well as in models including traditional risk factors: maternal smoking during pregnancy, maternal asthma and/or rhinoconjunctivitis, paternal asthma and/or rhinoconjunctivitis, current smoking in the household, older siblings, parental education, and having household pets during first year of life. Furthermore, additional adjustments were made for variables related to the anthroposophic lifestyle[6]: use of antibiotics, use of antipyretics, type of diet, measles infection, and measles, mumps, and rubella (MMR) vaccination. To assess cross-country heterogeneity, separate estimates for each country and a pooled weighted estimate using random-effect meta-analysis were calculated.[10]

RESULTS

Questionnaires were completed for 6 733 children, implying an overall response rate of 68% (Steiner school children, 67%, and reference children, 69%). In total, 103 questionnaires were excluded because the child's age was outside the designated range (5-13 years), missing, or lacking information on group belonging or sex, leaving 6630 (Austria, 11%; Germany, 39%; The Netherlands, 22%; Sweden, 9%; Switzerland, 20%) children to be analyzed. Of these, 4606 were Steiner school children and 2024 reference children.

In total, 28% of all included children provided a blood sample (1202 Steiner school children and 634 reference children). The resulting distribution of children with blood samples was Austria, 22%; Germany, 20%; Sweden, 26%; Switzerland, 18%; and The Netherlands, 15%. Overall, children who provided a blood sample had similar characteristics and prevalence of allergic disease as all children in the respective group (data not shown). However, although the prevalence of any allergic symptom or doctor-diagnosed disease was similar among those with and without blood samples among the Steiner school children, 30% and 29% respectively, it appeared higher for those with blood samples (36%) than those without (31%) in the Steiner reference group. Differences in symptom/disease rates related to blood samples between Steiner and Steiner reference children tended to be most pronounced in Sweden, Switzerland, and The Netherlands.

Characteristics of Steiner school and reference children are summarized in Table I. Considerable differences were seen comparing the anthroposophic lifestyle factors between the 2 groups. Antibiotics and antipyretics were less often used in the Steiner school children, whereas a diet mainly based on biodynamic food was found almost exclusively in this group. MMR vaccination was about 3 times more common in the reference group, and consequently, the prevalence of measles infection was 33%