Atopy in children of families with an anthroposophic lifestyle

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Summary

Background Increased prevalence of atopic disorders in children may be associated with changes in types of childhood infections, vaccination programmes, and intestinal microflora. People who follow an anthroposophic way of life use antibiotics restrictively, have few vaccinations, and their diet usually contains live lactobacilli, which may affect the intestinal microflora. We aimed to study the prevalence of atopy in children from anthroposophic families and the influence of an anthroposophic lifestyle on atopy prevalence.

Methods In a cross-sectional study, 295 children aged 5–13 years at two anthroposophic (Steiner) schools near Stockholm, Sweden, were compared with 380 children of the same age at two neighbouring schools in terms of history of atopic and infectious diseases, use of antibiotics and vaccinations, and social and environmental variables. Skin-prick tests were done for 13 common allergens, and we took blood samples from children and their parents for analysis of allergen-specific IgE-antibodies.

Findings At the Steiner schools, 52% of the children had had antibiotics in the past, compared with 90% in the control schools. 18% and 93% of children, respectively, had had combined immunisation against measles, mumps, and rubella, and 61% of the children at the Steiner schools had had measles. Fermented vegetables, containing live lactobacilli, were consumed by 63% of the children at Steiner schools, compared with 4.5% at the control schools. Skin-prick tests and blood tests showed that the children from Steiner schools had lower prevalence of atopy than controls (odds ratio 0.62 [95% CI 0.43–0.91]). There was an inverse relation between the number of characteristic features of an anthroposophic lifestyle and risk of atopy (p for trend=0.01).

Interpretation Prevalence of atopy is lower in children from anthroposophic families than in children from other families. Lifestyle factors associated with anthroposophy may lessen the risk of atopy in childhood.

Lancet 1999; 353: 1485–88
See Commentary page 1457

Introduction

Every third child in many industrialised countries has an atopic disorder. Although hereditary factors are important for the risk of developing allergic disorders, the increase in prevalence observed in recent years suggests that non-hereditary risk factors must play a substantial part. Immunological data show that different infections can either promote atopy (respiratory syncytial virus infections) or inhibit atopy (measles, hepatitis A, tuberculosis). A change in childhood infectious diseases, vaccination programmes, or both could partly explain this increase, although studies in Sweden did not show that BCG vaccination protected against atopy.

The immunological role of intestinal microflora in the development of allergy has also been investigated. Children in Estonia have lower rates of atopy than Swedish children and their intestinal microflora contains a larger amount of lactobacilli. Lactobacillus plantarum, most common in spontaneously fermented vegetables, can colonise the human intestinal mucosa and affect indigenous strains. Animal experiments and studies in vitro have shown that lactobacilli can change the interleukin profile and inhibit antigen-induced IgE production. Infants with milk allergy and atopic dermatitis had milder symptoms and fewer markers of intestinal inflammation if their milk formula was fortified with lactobacilli. Thus, intestinal microflora could play a part in the development of atopy.

The school of anthroposophy (Greek: wisdom about man) was founded in the early 20th century by Rudolf Steiner. Anthroposophy has been applied to education (Steiner schools), medicine, art, architecture, and agriculture (biodynamic farming). Anthroposophical doctors restrict the use of antibiotics, antipyretics, and vaccinations. Most children are vaccinated only against tetanus and polio, and most vaccinations are given later than recommended by the Swedish health authorities. As a result, in Sweden, measles occurs primarily in anthroposophic families. They also consume mostly local foods produced according to biodynamic principles. Vegetables preserved by spontaneous fermentation are a common dietary element, even for small children.

We aimed to compare the prevalence of atopy in children from anthroposophic families, who attend Steiner schools, with that of children at conventional schools.

Methods

In a cross-sectional study, children from two Steiner schools (A, B) in a village located 60 km south of Stockholm, Sweden, were compared with children from two control schools (C, D) in the same area. Steiner school A is situated in the countryside, in buildings constructed in the 1970s in the typical anthroposophic style. School B is located in a traditional school building from the 1930s in a built-up area. School C, adjacent to school B, was built in the 1960s, and school D is in a nearby village and was built in 1995.

All parents of children born in 1982–92 and enrolled in one of the four schools received basic information about our study...
by post. Those who agreed to participate were mailed a questionnaire on atopic symptoms, and on social and environmental variables. Information on history of infectious diseases and vaccinations was based generally on Child Welfare Centre data, which were available for all children.

Each child was clinically classified with respect to asthma, allergic rhinoconjunctivitis, atopic dermatitis, food allergy, and allergic urticaria. Between April, 1997, and October, 1997, clinical examinations were done. Two doctors (JS, JS) worked in parallel in each school and alternated between the two types of schools. We defined bronchial asthma as three or more episodes of wheezing before 2 years of age, or one episode from 2 years of age, or any episode of wheezing independent of age, if combined with atopic symptoms in the family or other atopic symptoms in the child. Allergic rhinoconjunctivitis was diagnosed if rhinitis or conjunctivitis appeared at least twice after exposure to a particular allergen and was unrelated to infection. Food allergy or allergic urticaria was diagnosed as acute onset of symptoms such as skin reactions, wheezing, vomiting, or diarrhoea on more than one occasion after ingestion or contact with a particular type of food or allergen. Atopic dermatitis was defined according to Hanifin and Rajka and assessed by use of the SCORAD index.12

We did a skin-prick test on the volar side of each child’s lower arm according to manufacturer’s instructions (ALK, Copenhagen, Denmark). The test included allergens for cladosporium, Dermatophagoides pteronyssinus, cat, dog, horse, birch, timothy grass, and mugwort (Soluprick, 10 Histamine equivalent potency, ALK), egg white (Soluprick, weight to volume ratio 1 to 100), codfish (Soluprick, 1 to 20), peanut (Soluprick, 1 to 20), cow’s milk (3% fat, standard foodstuff), and soy bean (Soja Semp, Semper AB, Stockholm, Sweden). Histamine chloride 10 mg/mL (Soluprick) was used as the control. We used the same batches of allergens (Phadiatop: cladosporium, Dermatophagoides farmae, Parietaria judaica, cat, dog, horse, birch, timothy grass, and mugwort) as well as Histamine chloride 10 mg/mL (Soluprick) were stored at 18°C before analysis. We tested samples for circulating IgE antibodies against 11 common inhalant allergens (Phadiatop: cladosporium, Dermatophagoides farmae, Parietaria judaica, cat, dog, horse, birch, timothy grass, and mugwort, olive, Parietaria judaica), nine food allergens (fx5: hen’s egg, cow’s milk, codfish, cow’s milk, peanut, soy bean, wheat flour), and five rodent allergens (ex70: guinea pig, rabbit, hamster, rat, mouse) according to manufacturer’s instructions (Pharmacia Upjohn Diagnostics AB, Uppsala, Sweden). In accordance with Pepys’ definition,15 children with at least one positive skin-prick test for any of the selected allergens, or for Phadiatop, fx5, or ex70, were judged to be atopic.

We analysed data by use of Stata 5.0 software (Stata Corporation, College Station, TX, USA), and estimated odds ratios and 95% CIs of atopy by logistic regression analyses. 95% CIs and p values (Wald test) were based on an estimator of variance that relaxed the assumption of independence between observations within families.11 A summary measure included 15 lifestyle exposures characteristic of the anthroposophical lifestyle in childhood (“Steiner units”), defined as no meales, mumps, and rubella vaccination, none of seven other vaccinations before 6 months old, antibiotics not more than twice, and not before 2 years old, antipyretics not more than twice, and not before 6 months old, consumption of fermented vegetables, consumption of these at least for a year, and consumption of mainly organic or biodynamically produced food in early childhood.

Table 1: Demographic data and risk factors for atopic disease in children from Steiner schools and control schools

Our study was approved by the local research ethics committee, and oral informed consent was obtained for each child.

Results

675 children aged 5–13 years took part in the study. In the Steiner schools, parents of 13 (4·2%) of 309 children refused to participate, 296 families were sent the questionnaire, and only one family refused to take part in the clinical study. In control schools, parents of 16 (3·9%) of 413 children refused to participate, 397 families were sent the questionnaire, and 17 (4·3%) refused the clinical study.

Demographic data and risk factors for atopic disease in children at the four schools are presented in table 1. Only half of the children at the Steiner schools had ever received antibiotics, compared with 90% in the control schools. A similar pattern is apparent for use of antipyretics. Immunisation against mumps, mumps, and rubella had been given to only 18% of the children at the Steiner schools, compared with 93% at the control schools. As a result, 71% of the children at the most typical Steiner school (A) got measles during an epidemic in 1995.

Fermented vegetables had been consumed by 63% of the children at the Steiner schools, compared with only 4·5% in the control schools. A similar pattern was shown for consumption of organic or biodynamic food during childhood. Breast feeding in infancy was of longer duration in children in Steiner schools than for controls (mean 5·7 months, Steiner, vs 4·3 months, controls). There were, however, no clear differences in other risk factors for atopy between the two groups, such as age, patterns of heredity, sex, parental smoking, or pets in the

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related to the size of the histamine weal. Results based on the degree and severity of sensitisation, as assessed by the number of positive skin-prick-test reactions or the sum of weal sizes, were consistent (data not shown).

24% of the children in Steiner schools had positive blood-test reactions, compared with 33% in the control schools (p=0.02). Positive reactions against airborne allergens (Phadiotop) were most frequent, mainly among children in the control schools. There was a marked difference in positive reaction to food allergens (fx5) between Steiner children and controls (p=0.02). Combining the results from the skin-prick test and the blood test, 24% and 34% of children were atopic in the Steiner and control schools, respectively (p=0.01). A similar pattern was shown if we used higher cut-off levels in the serological tests.

Comparison of atopic children with non-atopic children in terms of the characteristics of an anthroposophic lifestyle (table 3) showed that heredity and male sex were the greatest risk factors for atopy. Logistic regression showed that children from Steiner schools were at significantly lower risk of atopy (odds ratio 0.62 [95% CI 0.43–0.91]). Analyses based on comprehensive models, which included several characteristics of the anthroposophic lifestyle ("Steiner units"), were generally difficult to interpret because of strong correlations between different exposures. In analyses based on models that included the characteristic exposures separately, a tendency to negative correlation with atopy was shown consistently. There was an inverse relationship between the number of anthroposophic lifestyle characteristics and atopy risk (p for trend=0.01). In the group of children with more than ten out of 15 characteristic lifestyle features, the odds ratio for atopy was 0.56 (95% CI 0.36–0.87). The same trend was shown when the analysis was restricted to children from the Steiner schools only.

Discussion

We have shown that factors associated with an anthroposophic way of life are also associated with a lowered prevalence of atopy in children, both by clinical diagnosis and by serological or skin-prick diagnosis. However, several issues have to be considered in the interpretation of these findings. Measles has been inversely related to atopy,13,14 and a measles epidemic in 1995 could have played a part in the lower prevalence of atopic dermatitis in children at the Steiner schools than in children at control schools. Measles infection has obvious symptoms, and in our study the same doctor (JS) verified every case in the local epidemic. Given the restricted use of vaccinations and antibiotics, other infectious diseases could also have been more frequent in children with an anthroposophical lifestyle. These other diseases are, however, generally more difficult to verify by history and their roles in atopy are uncertain. Dietary factors may have been important in the lower prevalence of atopy in children at the Steiner schools than in children at control schools. Frequent consumption of fermented vegetables may affect the intestinal microflora, and the difference in duration of breast-feeding may have an influence on risk of atopy, although the protective effect of breast-feeding in the age group under study is uncertain.21 Other characteristics of an anthroposophic lifestyle, which were not investigated, could also have contributed to the differences in atopy between study groups.

Table 2: Signs of atopy according to clinical examination, skin-prick test, and blood tests in children from Steiner schools and control schools

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Atopy (n=181)</th>
<th>No atopy (n=427)</th>
<th>Odds ratio (95% CI)</th>
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<tbody>
<tr>
<td>Steiner-school pupil</td>
<td>66</td>
<td>205</td>
<td>0.62 (0.43–0.91)</td>
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<tr>
<td>Breastfed exclusively ≥4 months</td>
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<td>323</td>
<td>0.73 (0.48–1.11)</td>
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<tr>
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<td>No MMR vaccination</td>
<td>118</td>
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<tr>
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<td>174</td>
<td>0.63 (0.42–0.94)</td>
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Table 3: Odds ratios for atopy (95% CI) associated with exposure to factors typical for children in Steiner schools, plus heredity and sex

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Odds ratios adjusted for heredity and sex. MMR=meeasles, mumps, and rubella vaccination. *See test for explanation.
We could not identify a single lifestyle exposure factor primarily responsible for the lower prevalence of atopy in children at the Steiner schools, because behavioural characteristics of an anthroposophical lifestyle are strongly correlated. Furthermore the cross-sectional study design has limitations in that relevant exposures occurred several years beforehand and may thus have been reported with uncertainty, possibly including bias related to occurrence of atopy. However, an anthroposophical lifestyle mainly resulted from parental choice, and was experienced by the children during their whole life.

Non-response rates were similarly low in the two groups of children. Our controls were representative of the general population, since the prevalence of traditional risk factors, clinical atopy, positive skin-prick tests, and positive blood tests was similar to that in other Swedish studies. Selection of children to attend Steiner schools may have been related to atopy, but we believe that this was unlikely.

Lifestyle factors related to the anthroposophic way of life appear to lessen the risk of atopic disease in childhood. Since that way of life involves several characteristics that were more common in the general population some decades ago, our study may help to explain the recent increase in atopy. Further studies in this group of children would help to assess strategies of allergy prevention.

References


