THE WALK TO SCHOOL

Tree planting, air quality, global warming and their exponential impact on allergic rhinitis (AR) and asthma

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URBAN POLLUTION

| UK population living in urban areas (32) |
| Tree planting to mitigate pollution |
| POPULARITY OF BIRCH (4), and Department of Education (OfE) statutory guidance on sustainable travel (5), promote walking to school to increase physical activity in children, and more broadly to improve public health. |
| Greater exposure to allergenic pollen |
| Incidence of allergic rhinitis (AR) and asthma have increased significantly in the last 30 years (2,3). Coincidentally, birch (Betula spp) has been mass planted in urban areas, expanding the leaf canopy, with the intention to mitigate pollution. |

METHODOLOGY

- Literature and web search
- Clinical and scientific evidence sourced from a) hospital admission data, b) Incidence of AR and asthma in children, c) morphological traits of different tree species, and d) low pollen planting initiatives.

Birch: most popular street tree

- Aesthetic—beautiful bark and dappled light cast by leaves
- Recommendation as biofilter in Lancaster University study—disseminated by the media (6)
- Economy—reproductive trees to buy light leaf fall generates little street litter
- Health benefits—e.g. NHS Forest (7) and hospice gardens
- Lack of knowledge of pollen allergies and health impacts (8)

Pollination

Birch pollen is anemophilous (airborne and dispersed by wind). It is light and fine. By contrast, entomophilous pollen (dispersed by insects) is usually heavier and stickier, thus less likely to become airborne and cause respiratory allergy.

Sexual significance

Pollin is the male DNA of the plant world. Birch, like birch and hazel, is monocious—i.e. male and female flowers appear on the same plant. Some other species are dioecious—i.e. Individual plants are either male or female. Only the male plants produce pollen. Thus female clones should be used in higher ratios in low pollen planting schemes (9, 10, 11).

Pollin grain size

Birch grains measure 45mA and larger. On contact with the respiratory tract the pollen grains are more in much smaller particles (12). PM2.5 particles can easily penetrate the pulmonary alveoli (13).

Birch pollen season

- The National Pollin and Aerobiology Research Unit (NAPRU) calendar indicates that airborne birch pollen is present from March to May, depending on the weather (14).
- Pollen captured on children’s hair and clothes and taken indoors can extend the period of exposure by up to 2 months (15).

Environmental impacts of climate and culture

- Anthropogenic climate change
- More trees in green infrastructure (6) to mitigate global warming and pollution (19)
- Biodiversity of diverse allergenic tree pollen (20)
- Hard landscaping: pollen circulates in wind tunnels and encloses spaces, heightening exposure as pollen is not absorbed into hard surfaces (21)
- Fashion influencing epidemiology: birch monocultures (22)

Birch: low allergy alternatives

- Birch, together with birch and hazel, predominates in NAPRU pollen tests (23).
- Many low allergy trees have foliage suitable to capture PM2.5.

Avoid allergic pollen: the 5th principle

Worldwide examples of preventative solutions to minimise exposure to allergenic pollen.

UK statistics

- 3rd highest rate of AR in the world (32)
- The highest rate of asthma in the world (33)

Proven link between pollen allergy and asthma

- Of children with asthma also have a pollen allergy
- Allergies trigger asthma exacerbations in up to 90% of children with asthma (34)

Pollinic Syndromes

- Birch, birch and hazel are common triggers
- 7% children vs. 2% adults are susceptible to food allergies.
- In central Europe up to 70% of patients allergic to birch and birch pollen show symptoms of allergy to plant foods (35)

Impact of pollen allergy on daily life

- (36, 37, 38)

Prevalence pollinosis

- 1995 national exposure increased the risk of allergy (39)
- Birch pollen data (1 March to 10 June 2002-2012) from Armonk, New York established significant associations with over-the-counter allergy medication sales and daily asthma syndromes Emergency Department (ED) visits. Associations were strongest in children aged 5-17. (40)

Repeated exposure to pollen in the playground

- “Birch, the so-called ‘Tree of Life’, is being planted without awareness of its allergenic potential. The symptoms of AR can cause considerable morbidity in physical and emotional impact as well as the functional capacity of daily life. School Travel Plans encourage walking for healthier life prospects of children and families. Higher levels of airborne birch pollen coincide with the beginning and end of the school day (16). Some parents are unable to manage their allergy—but perhaps it is impossible to do so if repeatedly exposed to allergic tree species on the route to school and in the playground.

Conclusions

- Findings lead to the following recommendations for the UK to reduce exposure to allergenic birch pollen and associated symptoms and sensitisation among atopic individuals:
- Evidence-based, allergy-specific research and guidance to inform urban planning and green infrastructure development
- Clinicians to influence policy makers, regarding effects of climate, air quality and tree species selection on allergy and asthma
- Prioritise low pollen planting where children are at greatest risk of exposure, e.g. highways, school playgrounds, public parks environments accessed by children
- Stop planting birch
- Increase diversity of tree species to avoid excessive quantities of a specific pollen type at any one time, and to promote biodiversity
- Inter-professional MDT research and collaboration: Include allergy, botany and horticulture specialists.

Recommnendations for the UK

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