

Birch Pollen Asthma in The Netherlands

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The occurrence of birch pollen asthma is related to high birch pollen concentrations in the air, and therefore this type of asthma is rather common in Scandinavia. High birch pollen concentrations are rare in The Netherlands, but in the spring of 1984 extremely high levels were reached, whereas the concentrations of alder and hazel pollen were very low. During this period nine pollinosis patients known to the allergist developed asthmatic complaints. The appearance and disappearance of the asthmatic symptoms in these patients showed strong correlation with the course of the birch pollen concentration in the air, which strongly suggests that birch pollen asthma can occur in The Netherlands. The significance of this finding may be that this type of asthma can be observed regularly when the birch pollen concentrations are very high. This may also hold for other western European countries.

Key words: asthma; birch pollen; pollinosis.

Accepted for publication 25 April 1986

CLINICAL ASPECTS

Birch pollen asthma is common in Sweden and Finland. However, it may also occur in other European countries when the birch pollen concentrations in the air are high. In The Netherlands, airborne-pollen counts recorded over the last 16 years have shown that conditions for the development of this type of asthma occur at regular intervals of 4 to 5 years.

Hayfever is a well-known type of pollinosis due to atopy for grass pollen and occurs frequently during the spring and summer in The Netherlands (7). However, certain tree pollens can also cause pollinosis, the birch and alder pollens being especially responsible for such symptoms as conjunctivitis and rhinitis during the spring (19). If asthmatic complaints accompany the hayfever symptoms during the spring, the possibility of birch pollen asthma will seldom be considered, because this type of asthma is almost unknown in western European countries. It is only common in northern Europe, and particularly in Finland and Sweden, where birch pollen concentrations in the air reach very high levels (8, 23). In the spring of 1984, the concentrations of airborne birch pollen in The

Netherlands reached an exceptionally high level, and a number of pollinosis patients developed asthmatic symptoms suggesting birch pollen asthma.

MATERIAL AND METHODS

Patients

The nine patients (3 males and 6 females, aged between 27 and 54 years), who were seen in the out-patient allergy clinic of the Refaja Hospital in Dordrecht, all lived in a suburb of Dordrecht and had a clinical history of hay fever strongly suggestive of tree pollen allergy. A detailed clinical history was taken, including the type, severity, and duration of the symptoms.

In vivo tests

Skin test. In all patients intracutaneous tests were performed with the following commercially available aqueous allergen preparations (Diephuis Allergenen, Groningen, The Netherlands): grass, alder, birch and hazel pollen (10 and 100 Noon Units per ml (NU/ml)); house dust mite (*Dermatophagoides pteronyssinus*; 10 and 100 NU/ml), storage mite (100 NU/ml); cat, dog, guinea pig and rabbit dander (10 NU/ml). The results were recorded after 20 min and graded from 0 (negative) to 4+ (strongly positive). Saline (containing 0.4% phenol) served as negative control and histamine hydrochloride (0.1 mg/ml) as positive control.

Bronchial provocation test (BPT). The BPT was carried out with the same birch pollen extract as was used in the skin test. Saline containing 0.4% phenol served as negative control. Increasing concentrations of birch pollen extract were inhaled (1000–10,000 NU/ml) according to Debelić's method (6) described in detail by Wüthrich (24). The bronchial reaction was assessed on the basis of the forced expiratory volume (FEV₁) measured with the Vitalograph (Buckingham Ltd, United Kingdom). A decrease of at least 20% was regarded as positive.

For recording of the development of a later allergen-induced bronchoconstrictive reaction, all patients were asked to register three peak-flow values hourly (except during the night). A positive asthmatic reaction was considered to have occurred when the mean of three peak-flow values decreased by 20% or more relative to the initial value during 2 consecutive hours.

In vitro tests

Total IgE levels were determined with the Phadebas IgE PRIST (Pharmacia Diagnostic AB, Uppsala, Sweden) according to the manufacturer's instructions. The results were expressed in kU/l.

Specific IgE serum levels were measured by radioallergosorbent test (Phadebas RAST,

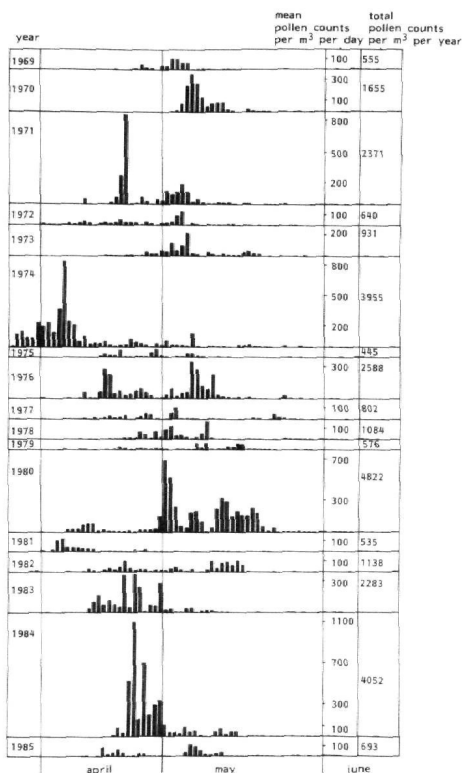


Fig. 1. Daily concentrations of airborne birch (*Betula*) pollen, between 1969 and 1985 in Leiden, The Netherlands.

Pharmacia Diagnostics AB, Uppsala, Sweden) according to the manufacturer's recommendations. Results were expressed in Phadebas classes 0 to 4, based on the Phadebas Reference System.

Birch pollen concentrations in the air

Quantitative daily birch pollen counts (expressed as the average mean number/m³/24 h) were obtained by continuous sampling with a Burkard volumetric spore trap in Leiden (19). The samples were analysed weekly and the counts published in the pollen bulletin issued by the Laboratory of Aerobiology.

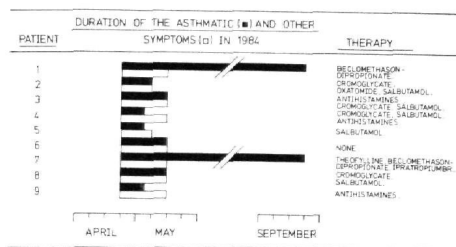


Fig. 2. Duration of and treatment given for asthmatic and other symptoms in nine pollinosis patients in the spring of 1984.

RESULTS

Fig. 1 shows the course of the birch pollen concentrations in the air in Leiden between 1969 and 1985. It is evident that these concentrations reached high levels in 1971, 1974, 1980 and 1984.

In 1984, the total pollen count amounted to 4052/m³. In that year the count for the week 24–30 April was 3313/m³, with a peak concentration of 1102/m³ on 25th April. For the period from 1969 to 1985, the means of the seasonal totals and day peaks are 1780 and 350, respectively. In the spring of 1984, the pollen counts for alder and hazel were negligible.

At the end of April 1984, nine pollinosis patients living in the vicinity of Dordrecht, a town situated about 80 kilometres from Leiden, returned to the allergist because of asthmatic complaints. The clinical symptoms of these patients in 1983, 1984 and 1985 are summarized in Table 1, and the period in 1984 during which they developed asthmatic symptoms is shown in Fig. 2, where concomitant symptoms (see also Table 1) and the treatment given are also indicated. The results of the skin test, bronchial provocation test with birch pollen, RAST and PRIST determinations, and total IgE determination are summarized in Table 2.

DISCUSSION

This paper concerns a number of clinical cases which suggest that birch pollen asthma can

occur in The Netherlands. This assumption is based on the appearance and disappearance of asthmatic complaints in relation to the birch pollen concentrations in the air. This phenomenon has not been previously reported in The Netherlands and only once in another western European country (France (16)). In the spring of 1984, birch pollen concentrations in the air in Leiden reached comparatively high values, as can be seen in Fig. 1. Other parts of The Netherlands also reported high concentrations of airborne birch pollen in the same period. In Helmond (near Eindhoven), in the southern part of the country, the total birch pollen count amounted to 18,000/m³ air in the week of 24–30 April. The peak concentration occurred on the 25th of April (1), and amounted to 5860/m³. Thus, it may be concluded that in this period birch pollen concentrations all over The Netherlands were extremely high, i.e., about three times the mean value over 16 years of observations. Other European countries also reported high birch pollen concentrations in the spring of 1984, i.e., Belgium (14), West Germany (12), The United Kingdom (11), and Denmark (22), which makes it very likely that birch pollen asthma also occurred in other parts of western Europe during the spring of 1984. This has been confirmed verbally by allergists in Germany (10) and France (17).

Cautious interpretation of Fig. 1 indicates that high birch pollen concentrations may be expected about once every 4 years, possibly not only in The Netherlands, but also in other western European countries. The factors which determine this frequency are as yet unknown. The importance of quantitative pollen counts as part of the complete clinical history of the patients and for the evaluation of the treatment of respiratory allergic diseases should not be underestimated (5, 15). Good correlation between the patients' symptoms and the pollen counts has been found in a number of studies (3, 13, 15, 23). According to Viander & Koivikko (23), all clinically sensitive patients develop symptoms of hay fever when the birch pollen counts exceed 80/m³. However, it is very difficult to establish limits for daily airborne pollen

Table 1
Clinical symptoms

Patient No.	Sex	Age	Symptoms in 1983 during		Clinical symptoms in spring 1983	Symptoms in 1984 during		Clinical symptoms in spring 1984	Symptoms in 1985 during		Clinical symptoms in spring 1985				
			spring	summer		spring	summer		spring	summer					
1	♀	44	++	-	-	conj., rhin.	+++	++	-	-	conj., rhin., asthma, e.i.a.	+	-	-	conj., rhin.
2	♀	30	-	-	-	-	+++	+/	-	-	conj., rhin., asthma, e.i.a.	-	-	-	-
3	♀	31	++	-	-	rhin.	+++	-	-	-	conj., rhin., asthma	-	-	-	-
4	♀	27	-	-	-	-	+++	-	-	-	(mostly in the morning) conj., rhin., asthma (at night + in the morning) conj., rhin., asthma (mostly at night)	++	-	-	conj., rhin.
5	♂	51	++	-	-	conj., rhin.	+++	-	-	-	conj., rhin., asthma (mostly at night)	-	-	-	-
6	♀	54	-	-	-	-	+++	-	-	-	conj., rhin., asthma	-	-	-	-
7	♂	33	-	-	-	-	+++	+	-	-	rhin., asthma	-	-	-	-
8	♂	37	++	-	-	conj., rhin.	+++	+/	-	-	conj., rhin., asthma	-	-	-	-
9	♀	34	+++	-	-	conj., rhin.	+++	-	-	-	conj., rhin., asthma	++	-	-	conj., rhin.

Abbreviations: conj.: conjunctivitis, rhin.: rhinitis, e.i.a.: exercise-induced asthma

Table 2
In vivo and *in vitro* test results

Patient No.	Skin test				BPT birch	RAST				Total IgE (kU/l)
	Alder	Birch	Hazel	Grass pollen		Others	Alder	Birch	Hazel	Others
1	+++	+++	++	+	+	mugw.: +	+++	+++	+++	-
2	+++	+++	++	+	+	h.d.m.: +/- cat: +/-	+++	+++	++	h.d.m.: +/- cat: +/-
3	+++	+++	+++	-	+	h.d.m.: +/- cat: +/-	+++	+++	+++	gr.p.: +/- cat: +/-
4	++	+++	+	-	+	dog: +/- g.p.: +/- rabb.: +/-	+++	+++	++	g.p.: +
5	+++	+++	+	+	+	s.m.: +/-	+++	+++	+	gr.p.: +
6	++	+++	++	-	+	-	+++	+++	+++	-
7	+++	+++	+++	-	+	s.m.: +/-	+++	+++	+++	-
8	+++	+++	+++	+	+	h.d.m.: + s.m.: + h.d.m.: + dog: +	+++	+++	+++	h.d.m.: + gr.p.: +
9	+++	+++	++	-	+	h.d.m.: + dog: +	+++	+++	+++	-

Abbreviations: mugw.: mugwort, h.d.m.: house dust mite, g.p.: guinea pig, rabb.: rabbit, s.m.: storage mites, gr.p.: grass pollen, BPT: bronchial provocation test (considered positive when fall in FEV₁ > 20% of the initial value), RAST: radioallergosorbent test.

concentrations leading to pollinosis symptoms because of the marked fluctuations of the airborne concentrations within the 24 h of a day, and the variability of the patients' sensitivity threshold during the season (20). Nevertheless, the relatively high daily concentrations in parentheses in the week of 24–30 April, i.e., 24 (528), 25 (1102), 26 (160), 27 (694), 28 (199), 29 (293), and 30 (337) make it very likely that clinically severe sensitive birch pollen patients would develop asthmatic symptoms due to these pollen.

The present patients showed positive reactions to birch, alder, and hazel pollen, both *in vivo* and *in vitro* (Table 2). This phenomenon is well known and is due to the cross-reactivity of these pollen allergens (2, 9). Since recording started, concentrations of airborne alder and hazel pollen have never reached high levels in The Netherlands, and therefore may not have masked the clinical reaction pattern observed in our patients. This too supports the view that birch pollen asthma does occur in The Low Countries.

In two of our nine patients the asthmatic complaints persisted until September. In these patients, inhalation provocation with birch pollen extract (in October 1984) induced an early- as well as a late-phase bronchoconstrictive reaction, and the asthmatic complaints persisted for 2 weeks. An allergen-induced late-phase asthmatic reaction is sometimes accompanied by elevated bronchial hyperreactivity (4), which might explain the duration of the asthmatic complaints in these patients. During the spring of 1984 they had probably been exposed to extremely high birch pollen concentrations that induced bronchial hyperreactivity. It is known that such induced bronchial hyperreactivity may disappear spontaneously after several months if contact with the inductive allergen (i.e., birch pollen) can be avoided (18).

The description of birch pollen asthma is of importance for western European countries, because pollinosis patients allergic to tree pollens may develop asthmatic symptoms when airborne birch pollen concentrations are high. This type of asthma is likely to be underestimated where recognition of the associated allergic respiratory phenomena is hampered by

the rather short period in which airborne birch pollen is usually present.

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