Allergy to pollen grains from Amaranthaceae and Chenopodiaceae in Cordoba, Spain. Annual and daily variation of pollen concentration

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We have studied the annual and daily variation of pollen grains from Amaranthaceae and Chenopodiaceae for 3 consecutive years. Samples of pollen grains from both families, which make a stenopalynologic group, were collected by the volumetric method with the aid of a Burkard spore-trap. These pollen grains were found to occur in the atmosphere of the city of Cordoba virtually throughout the year, although their presence was continual only between April and October with maximum concentrations detected in the summer months. We have also studied the daily variation of pollen concentration, which peaked between 10 AM and 3 PM. In order to determine the incidence of pollinotic patients sensitive to pollen grains from Chenopodium, we reviewed 1000 clinical records available in the Allergy Unit and found 8.42% to be allergic. On evaluation of the time evolution of the symptoms we found that most patients continued to show them until September each year.

INTRODUCTION
The Amaranthaceae and Chenopodiaceae families make a stenopalynologic group featuring rather similar pollen grains.

A variety of representatives of both families, namely Amaranthus albus, A. blitoides, A. retroflexus, Chenopodium album, Ch. ambrosioides, Ch. murale, Ch. opulifolium, Ch. vulvaria, Atriplex hastata, A. patula, and Beta vulgaris, occur commonly in the city of Cordoba and its surroundings, particularly in highly nitrified places. Some of them (e.g., Atriplex halimus, frequently used in hedge setting) are employed in gardening, so that the presence of their pollen in city air samples is hardly surprising.

Various authors have reported this group as an allergenic pollen producer. Among them are Subba Reddi in India, and Speksma et al, who consider the group as allergenizing pollen producers, although they also believe that they should not have too marked an effect on patients on account of their scarce occurrence in the atmosphere. Other authors such as Solomon, Saenz, Saumande et al, Al-Doory et al, and Singh and Babu have also reported that these plants induce pollinosis, while some are more specific in indicating particular species namely Chenopodium album, Ch. ambrosioides, and Amaranthus retroflexus.

Pollen from the Chen-amaranthaceae group has been reported as a constituent of the aeropollen in Lisbon, Portugal; Anakapalle and Visakhapatnam, India; Bangkok, Thailand; Taipei, Taiwan; Metropolitan Washington, DC Area; Limoges, France; Delhi, India; Cordoba, Spain; Catalonia, Spain; and Marion Isle, a sub-Arctic island where this pollen is considered to be the chief exogenous element detected in the samplings.

We studied the annual and daily variation of pollen grains from the Amaranthaceae and Chenopodiaceae families. They are of interest as potential allergenic pollen producers, particularly in summer, which is their period of greatest occurrence.

MATERIALS AND METHOD
Three populations each of the species of the Chen-amaranthaceae morphologic type occurring in the sampled area were studied. The material, obtained from herbarium sheets, was treated according to the acetylation technique originally described by Erdtman and later modified slightly by Hideux.

The annual and daily variation of pollen grains of this morphologic type in city air was determined by collecting samples for 3 consecutive years (1982-84). The sampling was carried out at the Faculty of Veterinary building in Cordoba, roughly 15 m above ground level, with the aid of a Burkard spore-trap.

Cordoba is a semi-rural city of 265,000 inhabitants lying in the southwest of Spain at about 120 m above sea level and featuring a Mediterranean to continental climate. The average annual rainfall and temperature are 674 mm and 18°C (average minimum, 30°C; average minimum, 7°C). These values were provided by the "Observatorio Especial y Medio Ambiente" of Cordoba and calculated from its records of the last 40 years.

Although the sampling spot was not too from the city center, the
elongated shape of Córdoba makes it rather vulnerable to the influence of the surrounding countryside and neglected suburbs.

The overall daily concentration was expressed in pollen grains per cubic metre of air.

In determining the daily variation pattern, grains were counted hourly throughout the day and the average concentration for each of the 24 hours was found in order to establish a representative day.

In order to determine the occurrence of pollinotic patients sensitive to the pollen grains from Chenopodium—the only genus from which extracts were available—we reviewed 1000 clinical records during 1 year at the Allergy Unit.

We selected those patients diagnosed as pollinotic and whose clinical records were consistent with total and specific IgE as determined by RAST and cutaneous tests by the prick test. From the pollinotic group, patients were selected who were found to be sensitive to Chenopodiaceae at the test bench. These were monitored in relation to the time evolution of their symptoms.

RESULTS AND DISCUSSION

The Chenopodiaceae and Amaranthaceae families make a stenopallynologic group (characterized by more or less slight variation in pollen morphology), featuring panto- porate grains (with the aperture more or less uniformly distributed over the pollen surface), 30 to 60 pores in number, granular apertural membrane, rugulate-seabrid exine, isopolar, spheroidal. Within the Amaranthaceae family, Erdtman reported the Amaranthus type to have "polyorate grains more or less like those of Chenopodiaceae."

The daily variation of the concentration of Chenopodiaceae pollen grains during the 3 years of investigation is plotted in Figure 1. As can be seen, the variation was quite homogeneous in 1983 and 1984 but somewhat more heterogeneous in 1982; the difference between the hours of maximum and

Figure 1. Hourly variation of pollen grains of Chenopodiaceae and Amaranthaceae (1982-84).

minimum occurrence being quite small. During the 3 years, pollen started to accumulate significantly after 8 AM, especially in 1982, which was marked by its high pollen production (Fig 2). The highest pollen concentration was detected between 10 AM and 3 PM (Fig 1). This pattern is quite similar to that reported by Käpylä for Turku, Finland, with a maximum at noon. On the other hand, Singh and Babu reported afternoon maxima for Delhi, India.

The data obtained from the aeropallynologic study are plotted in Figure 3. The pollen grains from these two families occur in the atmosphere of Córdoba virtually throughout the year, although they were found consistently only in the samplings performed between April and October.

Although most of the species encountered were typical of summer, some had spring blooming and gave few pollen grains from April to June. Nevertheless, the highest daily pollen concentration of 1982 (20 grains/m³ air) was measured on May 2. The occurrence of pollen grains in the air increased significantly in July 1982 and in June of 1983 and 1984, although the measured concentrations never reached exceedingly high levels (15 grains/m³ on July 15, 1982; 10 grains/m³ on August 25, 1983 and 6 grains/m³ on July 1, 1984). There were more grains during the summer of 1982 than during the other two years, probably because of the rain at the beginning of the season. (Fig 3).
Of the 1000 clinical records reviewed, 380 (38%) had pollinotic diagnoses. Of these 380 patients, 32 (8.42% of the pollinotic group and 3.8% of the overall group) were found to be sensitive to Chenopodium (Fig 4).

Only two patients were found to be monosensitive to Chenopodium. This figure accounts for 6.25% of the cases related to pollen from gramineae, 9.38%; to pollen from olive trees, 12.5%; and 71.88% to both (Fig 5).

In monitoring the time evolution of the symptoms in patients sensitive to pollen from Chenopodium, we found 50% of patients had symptoms up to September, while the rest only showed them until August (12.5%), July (21.9%), or June (15.63%). According to the experience of the Allergy Unit of our hospital, most pollinotic patients only show their symptoms in April and May (Fig 6).

Although most allergists believe that allergenic reactions can only be induced by pollen concentrations above 50 grains/m³, Leuschner and Boehm[2] found that the symptoms can be induced by grains remaining in the mucous membranes and conjunctiva for some time, even if the concentration of these grains in the air is not very high. Occasionally, the patient may be exposed even to pollen “clouds” borne in the air and passing undetected by the collector. Likewise, Strandhere and Wihl[6] consider the exact pollen concentration in the air to be of little relevance to allergy diseases insofar as the variation range cannot be accurately established.

As these plants have quite a long pollen production period—even though production levels are not very high—their sole occurrence could be the cause of summer pollinoses, as proposed by Spiessma et al[2] for some EEC countries.

We conclude that despite low incidence of sensitivity to Chenopodium (8.42% of all pollinotic patients), affected patients should be considered as candidates for immunotherapy in order to improve treatment efficacy.

REFERENCES
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