A Ten-Year Surveillance of Atmospheric Pollens and Moulds in the Bangkok Area*

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SUMMARY **Continuous determination of atmospheric allergens at an elevated observation point in Bangkok during the period from January 1972 to December 1981, using Durham's standard gravity method, has revealed the most common allergens to be grass pollens (53% of the total pollens) and Cladosporium (70% of the total spores) throughout the year, with their peaks in the winter months and the dry season, respectively. There was no significant change in these findings during the 10-year surveillance.**

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Environmental allergens such as pollens and fungal (or mould) spores are known to be the principal causative agents of naso-bronchial allergic diseases in humans.[1] Information on the distribution of pollens and mould spores in the atmosphere is not only beneficial to patients, but also is valuable to physicians in other parts of the world because it enables them to warn travelling patients about potential hazards in new environments.

We previously reported on a 3-year survey of atmospheric pollens and moulds taken at Siriraj Hospital in Bangkok between January 1972 and December 1974.[2] We have now finished a 10-year study at our hospital station. As a follow-up surveillance of the atmospheric environment, we considered that it would be interesting to report on the distribution of these potential allergens in the atmosphere of the same area over a longer observation period.

MATERIALS AND METHODS

Using Durham's standard gravity method,[3] detection of pollens and moulds in the atmosphere was carried out from the unobstructed roof of the nine-storey Siriraj Hospital building. This was done continuously throughout the period Janaury 1972 to December 1981.

Microscopic slides coated with a thin film of glycerine jelly were placed in the Durhams' device; they were routinely collected and renewed every Monday, Wednesday and Friday. After exposure, the slides were stained with Calberla's solution and examined under a microscope to identify the types of pollen and mould. The quantity of these was expressed as the number per square centimetre. The counts of each kind were added up to determine monthly totals as well as annual prevalence. Averages were also determined for the corresponding calendar months during each of the 10 years.

RESULTS

Table 1 displays the average quantity of each type of pollen and mould during the same calendar months of the entire 10-year period. Grass pollens were the most common (53 per cent of the total pollens). They were found throughout the year showing high prevalence during the period November through February (winter months) with annual peaks during the month of November in seven of the 10 years; annual peaks occurred during December in three of the 10 years. Weed pollens were the second most common type and most of them belonged to the chenopod-amaranthus group. Their count was low and peaked frequently (in seven out of 10 years) in August. The counts of tree pollens were small, a few being mango and rose apple types; the remainder could not be identified and had to be labelled as "unidentifiable pollens".

Many kinds of fungal spores were

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Table 1. Mould and pollen survey (average over the 10-year period 1972-1981) using Durham's standard gravity method.

Types	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Pollens												
Grass	138	103	68	46	35	41	23	33	31	94	251	240
Chenopod-amaranthus	11	7	9	5	7	7	5	29	11	9	24	19
Unidentifiable pollens	115	73	69	45	34	44	56	45	38	83	142	103
Moulds												
Cladosporium	979	737	499	448	344	263	140	192	56	152	779	471
Hetminthosporium	54	18	22	16	24	28	45	50	36	47	62	48
Alternaria	40	23	23	14	23	25	25	25	21	31	51	38
Fusarium	24	13	10	8	13	15	13	32	37	42	39	21
Ascospore	15	13	12	3	9	7	7	16	14	21	24	18
Rust	16	15	9	3	10	5	7	12	9	20	27	22
Smut	13	18	9	8	7	9	11	6	12	7	26	23
Curvularia	14	7	8	4	5	4	4	6	8	13	22	17
Torula	5	4	2	3	4	3	4	12	5	5	10	9
Tetraploa	8	4	2	2	2	4	2	5	4	7	8	8
Stemphylium	4	2	1	1	3	2	2	2	7	7	6	4
Leptosporium	3	3	2	1	2	2	2	2	5	6	5	3
Unidentifiable moulds	40	24	28	16	16	20	31	27	30	43	65	51

Table 2. Annual incidence of atmospheric allergens

Types	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Pollens										
Grass	953	1,518	1,693	1,255	1,553	1,128	515	467	1,006	1,169
Chenopod-amaranthus	67	96	164	155	213	221	249	139	32	72
Unidentifiable pollens	419	600	971	719	619	844	907	1,492	1,248	862
Total	**1,439**	**2,214**	**2,828**	**2,129**	**2,385**	**2,193**	**1,671**	**2,078**	**2,286**	**2,103**
Moulds										
Cladosporium	2,939	1,557	3,629	5,419	6,327	5,163	5,800	3,019	9,252	8,199
Helminthosporium	814	412	496	352	523	447	500	471	295	401
Alternaria	346	286	209	369	431	419	221	215	538	432
Fusarium	166	259	170	187	181	255	333	598	211	313
Ascospore	64	77	78	127	133	159	266	338	187	157
Rust	22	244	91	165	182	278	204	152	124	78
Smut	178	131	295	121	242	239	106	29	20	131
Curvularia	29	45	57	55	72	95	267	241	131	119
Torula	41	26	27	98	64	36	102	157	51	110
Tetraploa	19	39	35	57	54	54	87	100	44	51
Stemphylium	13	10	10	31	39	29	70	65	57	67
Leptosporium	11	15	14	35	39	40	73	33	20	59
Unidentifiable moulds	283	240	372	353	367	477	589	482	382	347
Total	**4,925**	**3,341**	**5,483**	**7,369**	**8,654**	**7,691**	**8,618**	**5,900**	**11,312**	**10,464**

identified. The class *Fungi imperfecti* predominated, of which *Cladosporium (Hormodendrum)* was the most common (70 per cent of the total spores). This type was found throughout the year, with peaks during the dry season: during the 10-year period seven peaks occurred between November and February (winter) and three between March and May (summer); the yields declined during the period June-October (rainy season).

Table 2 shows the annual distribution of each kind of pollen and mould during the 10-year period of observation. Despite the fluctuating findings in different years, there were no statistically significant differences ($p > 0.05$ for both pollens and mould spores) during the 10-year period.

DISCUSSION

The present study shows the distribution in Bangkok of atmospheric pollens and mould spores which are, on the whole, similar to those reported by other investigators.[2,4-6] From these studies, it is possible to conclude that grass pollens are the most commonly found in Bangkok and that they may be found throughout the year, with peaks during the winter months. There was no significant change in these findings during the 10-year surveillance. These observations indicate that grasses in tropical and subtropical areas pollinate all the time, whereas in temperate regions of the northern hemisphere the peaks usually occur from May to July.[7]

Weed pollens, which were found in moderate counts with peaks often occurring in August, could have important clinical implications since 48 per cent of asthmatic Thai children have had positive skin tests to weeds.[8]

Among the moulds, *Cladosporium* was most commonly found throughout the year with high counts during the dry season. The reproductive units of *Cladosporium, Alternaria,* rust and smut, are detached by direct scouring or wind-induced substrate motion. Such dry spore dispersal increases as air-speed rises and relative humidity falls; thus dispersal reaches the maximum level during sunny afternoons.[7] There was no significant statistical difference in these findings during the 10-year period.

Because pollen and mould peaks occur during the winter, their presence may be another precipitating factor that renders Bangkok patients more prodigious to asthmatic attacks in the winter, besides cold air and increased viral infections of the respiratory tract.[8]

Spores of *Cladosporium, Helminthosporium, Alternaria* and *Fusarium* belong to the so-called "Field fungi" group; they were found in abundance in our study and have been shown to be prevalent in almost all surveys of outdoor air. The failure to find spores of yeast, *Aspergillus* and *Penicillium* in the present study is attributed to the intrinsic inclination of the slide method;[9] however, it has been shown by the culture-plate method that significant numbers of such spores are present in our atmosphere.[10] It is, therefore, imperative that results obtained by either of these methods should be carefully interpreted in the light of substantial clinical data. It must be reiterated here that the prevalence of any pollen and fungal spores in the air does not always indicate their aetiologic relationship to allergic respiratory diseases.

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