LETTERS TO THE EDITORS

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Possible Role of Basidiospores as Air-borne Allergens

THE role of air-borne mould spores in asthma, especially *Alternaria* and *Cladosporium*, has been recognized as the result of the work of Feinberg¹ and Durham². These workers used mainly the gravity slide and Petri dish exposure method to determine the spore content of the air. Both methods are highly selective for different reasons: the former catches larger pollen grains and spores and rarely catches small spores, while the latter only records organisms able to grow on the culture media exposed and

is therefore reasonably efficient for the size-range of basidiospores, and gives a direct measure of spore concentration per unit volume of air.

The number of hyaline basidiospores fluctuates rapidly. Transient clouds of hyaline basidiospores were observed at various times. For example, on July 22, 1951, after eight rainless days with a high concentration of *Cladosporium* and *Ustilago*, a thunder shower with 2 mm. of rain falling between 13.00 and 15.00 hr. washed the air almost free of pollen and spores. Four or five hours after the rain had fallen a high concentration of minute hyaline basidiospores was observed, reaching a maximum of about 30,000 per metre³ at about 02.00 hr. on July 23, and disappearing almost entirely as the *Cladosporium* cloud became re-established between 05.00 and 08.00 hr. It is possible that these hyaline spores, which are conveniently counted under phase contrast, were liberated by leathery resupinate Agaricales and by Tremellales after wetting by the rain.

The numbers of coloured basidiospores, mainly from Agariceae, were remarkably uniform, and were easily counted on the trace with a high-power dry objective. Their concentration in late summer greatly exceeded pollen concentrations recorded by us in June. From August 9 to September 23 the daily mean concentration of coloured basidiospores seldom fell below 1,000 per metre³ of air (see accompanying illustration). Identification on the trace has not been carried far at present, but spores of species of *Panæolus*, *Hypholoma*, *Bolbitius*, *Ganoderma*, etc., have been observed.

On dry days the basidiospore concentration showed a peculiar diurnal fluctuation, being lowest in the afternoon and increasing by 3-5 times in the early hours of the morning. This contrasts strongly with other spore types studied which have minimum concentrations at night. The fruit bodies liberate spores at a relatively uniform rate

and the higher concentration at night may be due to less rapid dilution of the spore cloud owing to wind velocity and turbulence being lower than during the day.

The exposure of the trap in an arable field adjacent to grassland with trees must be representative of vast rural areas in the temperate regions. The steady high concentrations of basidiospores associated with the seasonal flush of agarics and polypores obviously need investigating in connexion with seasonal asthma.

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April 17.

¹ Feinberg, S. M., "Allergy in Practice", 2nd edit. (Chicago 1946).

² Durham, O. C., "Aerobiology", Pub. of the Amer. Assoc. Adv. Sci., No. 17, 32 (1942).

³ Hirst, J. M., *Ann. App. Biol.*, **39**, 257 (1952).

⁴ May, K. R., *J. Sci. Instr.*, **22**, 187 (1945).

Daily mean number of basidiospores per cubic metre of air at 2 metres above ground at Rothamsted, August 1 to September 30, 1951 (data obtained with automatic volumetric spore trap)

therefore selects the more readily growing moulds. Feinberg¹ has stated that basidiospores cause respiratory tract allergy, but data on their occurrence in the atmosphere have been lacking, no doubt because they are not detected by the usual methods.

In studies concerned primarily with fungi pathogenic on crop plants we sampled the air at the height of 2 m. above a potato plot continuously from June 1 to September 30, 1951, using an automatic volumetric spore trap described by Hirst³. In this apparatus, which is based on the cascade impactor of May⁴, air is drawn through the trap at the rate of 10 litres per minute and the spores are impacted on a 'Vaseline'-coated slide which is moved past a 2-mm. wide slit at 2 mm. per hour. The resulting 24-hr. trace can be scanned under the microscope and the time of deposition of a spore determined with an error of about ± 1 hr. This type of trap is relatively non-selective for particles in the size-range of plant spores, and has been shown to collect and extract from the air not less than 60 per cent of spores as small as those of *Ustilago avenae* (diam. approx. 6.5μ). It