Significance of fungi in the house dust of asthmatic patients in Lucknow*

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The present investigation, conducted in Lucknow, is aimed to locate the source and concentration of fungal components in house dust and their relevance to allergic disorders causing health hazard in human beings. Both qualitative and quantitative studies have been carried out, collecting 7 samples from houses of asthmatic patients, using culture plate method. House dust analysis showed the preponderance of fungal forms. It revealed the presence of thirty two fungal forms, out of which, species of *Aspergillus, Alternaria, Penicillium, Curvularia*, etc. were found to be potentially allergenic.

Key-words—Fungi, House dust, Allergy.

INTRODUCTION

THE close relationship between pollen/spores frequency and allergy symptoms was first recognised by Blackley (1873). Since then, the role of airborne fungal spores in the causation of respiratory allergy is well established (Prince & Morrow 1969; Cooper 1970). The fungal spores are predominantly present in indoor air and may initiate acute allergic response in susceptible individuals. High fungal spore counts have been reported to be associated with an increase in allergenic symptoms (Flannigan *et al.* 1990). In India information on mycoflora in home environment and house dust is meagre except a few reports from Lucknow (Agnihotri *et al.* 1980; Singh *et al.* 1981), Aurangabad (Tilak & Patil, 1981), Bangalore (Agashe *et al.* 1992) and Madras (Raghu & Vittal 1992).

An indoor mycofloral study was undertaken from the residences of patients suffering from allergic bronchial asthma/rhinitis where they are constantly exposed to various biopollutants. Therefore, the quantitative and qualitative analyses of house dust samples were carried out for an appropriate diagnosis and effective treatment of respiratory allergy due to fungal spores. The bulk house dust samples were collected by sweeping and manual brushing of floor, sofa set, bedsheet, mattress, etc. in sterile polythene bags from seven houses of the patients suffering from allergic disorders. The mycoflora was analysed by using serial dilution plate technique. One millilitre of the dilution was transferred to sterile petriplates with the help of sterile pipette and then melted Czapek's Dox agar was poured. The plates were incubated at 28°C ± 2°C and colonies growing on them were recorded and identified with the help of available literature (Ainsworth *et al.* 1973; Barnet & Hunter 1987; Subramanian 1971).

OBSERVATION AND DISCUSSION

House dust is generally composed of pollen, fungal spores, algae, protozoan cysts, insects and their body parts, fragments of vegetal matters, etc. It also contained various organic substances such as food particles, skin scales, danders, etc. which provide ideal substrate for microorganisms to develop and proliferate (Tilak, 1987). Apart from these, *Dermatophagoides pteromyssinus*, a house dust mite, has been recognised as major causal organism for allergy in sensitive adults in U.S.A. (Kern 1921). Similarly, Bardapurkar (1981) reported house dust to be common cause of upper and lower respiratory systems. Wadhwani *et al.* (1992) found 8% cases of house dust allergy among the age group of 41-65 yrs.

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Table 1 - Species of fungi isolated from seven house dust samples with their percentage contribution to the total air mycoflora.

Fungi	S.No. 1	S.No. 2	S.No. 3	S.No. 4	S.No. 5	S.No. 6	S.No. 7
Mucor himelis Wehmer	–	–	–	–	5.00	–	–
Rhizopus stolonifer Ehrenb. ex Corda	–	–	–	3.10	–	–	2.56
Chaetomium globosum Kunze & Schm	1.85	7.40	–	–	10.00	–	–
Emericella nidulans (Thom & Raper) Subran.	25.90	18.50	32.90	6.20	–	–	10.20
Melanospora sp. Corda	–	11.10	–	–	–	–	–
Alternaria alternata (Fr.) Keissler	–	–	4.80	–	7.50	–	–
A. solani (Ellis & Mart.) Jones & Grant.	–	–	–	–	2.50	–	–
Aspergillus carneus (Van Tieghem) Bloch	–	–	–	–	–	11.11	–
A. flavus Link	6.57	11.10	4.80	25.00	17.50	–	20.50
A. fumigatus Fres.	1.85	–	–	–	–	–	–
A. nidulans (Ediam) Wingate	–	–	–	–	2.50	–	–
A. niger Van Tiegh	–	14.80	–	–	–	–	2.56
A. niveus Blotch	–	–	–	–	–	19.44	–
A. tamarii Kita	1.85	–	–	3.50	–	–	–
A. terreus Thom	3.70	–	4.00	12.50	5.00	–	7.60
Cladosporium cladosporioides (Fres) de Vries	–	–	–	–	12.50	–	10.20
C. herbarum (Pers.) Link ex Gray	–	–	–	6.20	–	–	–
Curvularia lunata (Wakker) Boeddijn	21.30	7.50	7.30	31.00	12.50	11.11	7.69
C. tetramera (Mc Kinney)	19.47	25.90	7.30	12.50	15.00	13.88	–
Epicoccum sp. Link	0.92	–	–	–	–	–	–
Fusarium oxysporum Schlecht.	1.85	–	1.20	–	10.00	2.77	5.59
F. moniliforme Link.	–	3.70	–	–	–	–	–
Helminthosporium spiciferum (Bain) Nicot.	5.52	–	3.60	–	–	–	–
Memnoniella sp. Honn.	2.77	–	–	–	–	5.55	7.60
Monilia sp. Pers. ex Fr.	0.92	–	–	–	–	–	–
Nigrospora sp. Sacc.	0.92	–	–	–	–	–	–
Penicillium citrunum Thom	0.92	–	25.70	–	–	2.77	10.20
P. funiculosum Link.	–	–	6.00	–	–	11.11	–
Stachybotrys sp. Corda	1.85	–	–	–	–	16.65	–
Trichoderma viride Pers. ex Fries	–	–	2.40	–	–	–	–
Rhizoctonia sp. DC	0.92	–	–	–	–	–	–
Mycelia sterilia	0.92	–	–	–	–	5.61	15.30

Thirty two species belonging to twenty genera, were isolated from seven house dust samples (Table 1). A great majority of fungi recorded belonged to fungi imperfecti especially Hyphomycetes and most of the species were recorded sporadically. However, *Curvularia lunata* was encountered in all the samples and *C. tetramera* in six samples. *Aspergillus flavus*, *A. terreus*, *Fusarium oxysporum* and *Emericella nidulans* were frequently recorded.

The genus *Aspergillus* was represented by 8 species, viz., *Aspergillus carneus*, *A. fumigatus*, *A. flavus*, *A. nidulans*, *A. niger*, *A. niveus*, *A. tamarii* and *A. terreus*, out of which *Aspergillus niveus* and *A. carneus* were reported in sample no. 6, *A. nidulans* in sample no. 5 and *A. fumigatus* in sample no. 1 only. The species of *Monilia*, *Rhizoctonia*, *Nigrospora* and *Epicoccum* were recorded in sample no. 1; *Alternaria solani* and *Mucor himelis* in sample no. 5 and *Fusarium moniliforme* in sample no. 2 only.

Wadhwani *et al.* (1992) reported the result of skin prick test on sensitive individuals carried out at King George Medical College, Lucknow which can be well correlated with the present studies. The allergenicity of a few taxa such as *Alternaria alternata*, *Aspergillus flavus*, *A. fumigatus*, *A. nidulans*, *A. niger*, *A. terreus*, *Cladosporium cladosporioides*, *Curvularia lunata*, *Fusarium oxysporum*, *Helminthosporium spiciferum*, *Monilia* sp., *Penicillium citrunum* and *Trichoderma viride* have been proved which are also encountered in the present investigation. Agarwal and Shivpuri (1974), Jamil *et al.* (1981) and Wadhwani *et al.* (1986) also supported the allergenicity of Aspergilli.

It is envisaged that the accumulation of house dust is unavoidable, to some extent, so preventive measures should be taken. First of all, poorly ventilated, damp and dark houses should be avoided which provide suitable substrate for the growth and development of microorganisms. Secondly, desensitization should be get done after identifying the offending allergen.

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