

Indoor airborne mould spores

SUZANNE GRAVESEN

Allergologisk Laboratorium, Diagnostic Dept., Copenhagen

In the literature prevalences of Type I -allergy to moulds are ranging from 2–30 % of an allergic population. This discrepancy may be explained partly by the variable quality of the extracts earlier used, partly by ignorance of moulds as an ethiological factor in respiratory allergies. Prevalences of Type III -allergy evoked by microorganisms is essentially unknown.

Type I -allergy to mould-allergens is not a special feature of allergy but affects patients with atopic predisposition like the other common allergens. As a consequence, mould-allergy seldomly acts alone. The anamnesis may give suspicion to mould-allergy.

Patients with e.g.:
symptoms out of, or in prolongation of the pollen season

or symptoms after change of residence (home/occupation, flat/country house)

or symptoms in humid rooms (e.g. basement or bathroom)

or symptoms in relation to use of humidifier

or positive skin reaction (related to a histamine controll) to one or several mould-extracts

or increased total IgE without any established exogenic factors,

may go into a more detailed environmental elucidation. Patients living in humid buildings are especially under suspicion.

Moulds may be divided into inevitable (outdoor) and evitable (indoor) sources. The aim of detection of both types is partly

to take different precautions, partly to establish a fungal allergen avoidance.

It is essential to stress that moulds, like real higher plants, have specific demands to the environment for an optimal growth. Climatic factors such as temperature and humidity will have an influence on the composition of the mould flora as well as on the higher vegetation. The moulds causing Type I -allergy may be present in great amounts in the outdoor as well as the indoor air. These are *Cladosporium*, *Alternaria*, *Penicillium* and *Aspergillus*. Besides *Mucor*, *Aureobasidium* and *Botrytis* are regarded to be important allergenic micro-fungi.

The indoor environment naturally changes much more than the outdoor climate. As a result, special ecological niches can be created with occurrence of other moulds than the ones which are dominating outdoors.

INDOOR REGISTRATION (settle-plate method – semi-quantitative)

In Denmark indoor mould surveys have been an important supplement to the clinical investigations. Demonstration and identification of indoor moulds may serve various purposes. In general, it gives an idea of the specific exposition to the different mould genera. Seasonal variation with peaks in late summer and autumn (with exception of *Penicillium*, which is a year-round mould) is demonstrated. Although the fungi are encountered indoors, it seems that the majority of the moulds has a certain

relationship with the outdoor vegetation of higher plants.

Demonstrations of the mould flora directly related to the patient's environment are routinely performed in our laboratory. Patients who are clinically suspected of mould allergy are sent culture plates; these are exposed in their homes or at their working-places. Results from the cultivation of settled spores from different places, as well as spores from samples of house dust, reveal some of the microfungi to which the patient is exposed. These results may be helpful when considering whether to renovate certain rooms in the home or place of work. Mould analyses may serve as a test of the efficacy of environmental control at home or at work. »Much more commonly, environmental control should be employed as an adjunct to other forms of therapy including the use of hyposensitization and pharmacological agents» (Pepys).

Whether the mould sensitive patient is subject to immunotherapy or not, elimination treatment is recommended, especially in bedrooms to avoid fungal attacks for 7–8 hours.

VOLUMETRIC METHODS (quantitative)

Volumetric collectors with a fixed sampling efficiency are available today for studying the potentially allergenic air-borne microfungi. Two methods: the »viable» and the »non-viable», are generally applied either separately or simultaneously.

The non-viable slide method (Burkard Trap) is mainly used for pollen- and spore-counts outdoors with the drawback that only a selected group of moulds can be identified on the slides.

If a volumetric measurement of the spore content with emphasis on viable genera is required indoors or outdoors, the BIAP Slit-Sampler is a useful tool.

This »viable» technique requires that spores are able to germinate and grow, which means that true parasites (e.g. Smuts, Rust) and the basidiomycetes cannot be registered. This method is used routinely in our laboratory.

As common moulds are subjected to an increasing industrial exploitation environmental control is of great importance in order to protect people from unwanted fungal exposure.

AIRBORNE ACTINOMYCETES

The ecology of actinomycetes as well as the role of actinomycete-spores in respiratory allergy has been excellently reviewed by Mary Lechevalier and John Lacey respectively in the book »Actinomycetes» from 1981. Not until 1963 was it realized that actinomycetes could cause other diseases apart from infections, although in the thirties Campell associated outbreak of Farmer's Lung with white dust released from mouldy hay. This liberation of spores which, during handling of hay, leads to inhalation of massive concentrations which

Moulds commonly encountered in air- and house-dust analyses in Denmark

Species	Substrate	Prevalence		Out-door season
		Air	Dust	
<i>Alternaria</i>	Leaves	22 %	85 %	August
<i>Aspergillus</i>	Universal	15 %	48 %	All year
<i>Aureobasidium</i>	Leaves, drains, plugholes	8 %	16 %	
<i>Botrytis</i>	Fruit (grape, strawberries)	4 %	8 %	May and October
<i>Cladosporium</i>	Leaves, textiles, paper, food	48 %	53 %	June–August
<i>Mucor</i>	Starchy food	5 %	96 %	
<i>Penicillium</i>	Universal	47 %	95 %	All year
<i>Phoma</i>	Potatoes, paint	5 %	6 %	
<i>Ulocladium</i>	Leaves	19 %	43 %	August

again may result in Extrinsic Allergic Alveolitis (American: Hypersensitivity pneumonitis).

Exposure to spores of actinomycetes is most likely to occur during occupation (Farmer's Lung). Inhalation of spores in quantities large enough to raise specific IgG antibodies has, however, been demonstrated following stay in mouldy houses suffering from water damage. Likewise it is seen due to exposition to infected humidifiers and to wall-to-wall carpets subjected to either waterdamage, or to wetting in order to solve problems with static electricity.

The above-mentioned detection-methods also apply to elucidation of the pathogenic microbial agents related to Type III -allergy.

REFERENCES

- Al-Doory, Y. and Domson, J. F.: (Eds.) *Mould Allergy*. Lea & Fibiger 1984.
- Gravesen, Suzanne: Fungi as a cause of Allergic Disease. *Allergy* 34: 135-154, 1979.
- Larsen, Lisbeth, S.: A Three-Year-Survey of Microfungi in the Air of Copenhagen 1977-79. *Allergy* 36: 15-22, 1981.
- Lacey, J.: Airborne Actinomycete Spores as Respiratory Allergens. In: Schaal, K. P. and Pulverer, G. (eds.): *Actinomycetes*. Zbl. Bakt. Suppl. 11, Gustav Fischer Verlag, Stuttgart, New York, 1981.
- Lechevalier, M. P.: Ecological Associations Involving Actinomycetes. In: Schaal, K. P. and Pulverer, G. (eds.): *Actinomycetes*. Zbl. Bakt. Suppl. 11, Gustav Fischer Verlag, Stuttgart, New York, 1981.
- Pepys, J. and Davies, R. J.: Allergy. In: Clark, T. J. and Godfrey, S. (eds.): *Asthma*, chap. 7. Chapman & Hall, London, 1977.
- Salvaggio, J. and Aukrust L.: Mould-induced Asthma. *J. Allergy Clin. Immunol.* 68, 327, 1981.

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.