ARE AIR-BORNE MYCOTOXINS A PUBLIC HEALTH CONCERN IN PORTUGAL?

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Introduction

Microscopic filamentous fungi, under suitable environmental conditions, can lead to the production of highly toxic chemical substances, commonly known as mycotoxins. The most widespread and studied mycotoxins are metabolites of some genera of moulds such as *Aspergillus, Penicillium* and *Fusarium*. Quite peculiar conditions may influence mycotoxin biosynthesis, such as climate, geographical location, cultivation practices, storage and type of substrate. Toxicity has been extensively investigated for the most important mycotoxins, such as aflatoxins, ochratoxin A and *Fusarium* toxins, and much information derived from toxicokinetics in animal models has also been obtained. The adverse effects are mainly related to genotoxicity, carcinogenicity, mutagenicity, teratogenicity and immunotoxicity.

Aim of the Study

To identify fungal species able to produce important mycotoxins in different Portuguese settings.

Methodology

Descriptive studies were developed to monitor air fungal contamination in different settings such as 10 gymnasiums with swimming pools, two elementary schools, one maternity, one hematological unit, 10 hospitals' food units, two companies' food units and one poultry.

Fig. 1 Air sampler

Air samples were collected through impaction method. Surface samples were collected by using pre-moistened swabs and a 10 by 10 cm square stencil.

Results

Air and surfaces of seven different types of settings were analyzed in order to detect fungal species potential producers of mycotoxins (Table 1).

Table 1. Results obtained on air and surfaces

Setting	Most frequent fungi	*Aspergillus* species
Gymnasiums with swimming pools (Air)	*Cladosporium* sp. (36.6%) *Penicillium* sp.(19.0%)	*A. flavus, A. niger, A. glaucus, A. fumigatus, A. parasiticus, A. restrictus* and *A. sydowii*
Elementary schools (Air)	*Cladosporium* sp. (52.2%) *Penicillium* sp. (27.5%)	*A. flavus, A. niger* and *A. ochraceus*
Hematological unit (Air)	*Penicillium sp.* (44.6%), *Aspergillus sp*. (28.2%)	*A. flavus, A. niger* , *A. versicolor*
Maternity and hospitals' food units (Air)	*Cladosporium* sp. (28.4% - 23.2%) *Penicillium* sp. (41.5% - 43.6%)	Maternity *(A. versicolor, A. fumigatus, A. ochraceus* and *A. niger)* Hospital food units (*A. versicolor, A. niger, A. flavus, A. ochraceus, A. candidus, A. fumigatus*, and *A. niveus)*
Companies' food units (Air)	*Cladosporium* sp. (71.2%) *Penicillium* sp. (13.0%)	*A. glaucus*
Poultry (Air)	*Cladosporium* sp. (40.5%) *Alternaria* sp. (10.8%)	*A. fumigatus, A. flavus* and *A. niger*.
Sampled surfaces	*Penicillium* sp. was the most frequent isolated genus with an exception to gimnasiums with swimming pools and the hematological unit where the most frequent genus or species detected were *Fusarium* sp. and *A. flavus* respectively.	Hematological Unit *A. versicolor*, *A. niger*, *A. fumigatus*, , *A. glaucus, A. nidulans*

Conclusions

All the analyzed settings are contaminated by fungi known as mycotoxins producers. Considering the public health risk due to possible air contamination and exposure to mycotoxins by inhalation, preventive measures must be taken.

It was also possible to perform the detection of *Aspergillus* species. Although some *A. flavus* strains do not produce mycotoxins, aflatoxin presence is possible to occur in some of the studied settings. Furthermore, Aflatoxin B1 has been classified as a human carcinogen (hepatocellular carcinoma) by the International Agency for Research on Cancer with a sufficient evidence in humans and a strong support that main mechanism is genotoxicity

Additionally, in some of the studied settings, risk assessment must be performed considering the toxicological interactions between mycotoxins and the sensibility of the exposed population.

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