Environmental assessment of an asthma education program: Relationship between airborne fungi and IgE levels in children and adults

Avaliação ambiental de um programa de educação em asma: Relação dos fungos do ar e os níveis de IgE em crianças e adultos

To the Editor:

The implementation of an asthma education program in higher and continuing education is relevant and can have a positive effect on professional practice. The interaction between the results of such educational programs and patients has been explicitly evidenced by improvements in the symptoms of asthma in patients treated at university health services.[1] Teaching-learning methods are essential for asthma treatment adherence and control in teaching hospitals. Studies of educational interventions aimed at increasing the cleanliness of the home environment have shown improvements in indoor air quality and in the health of children with asthma.[2] The performance of the professional staff working at such health facilities allows reflection on the benefits of the program to the public of the university community and to society.[3] The development and assessment of an asthma education program enables environmental control in a preliminary way for the understanding of the outdoor fungal microbiota, corroborated by the investigation of total IgE and specific IgE to organisms of the genera *Aspergillus*, *Penicillium*, *Fusarium*, and *Neurospora*, investigated as etiologic agents of asthma or rhinitis.

In the *Programa de Assistência ao Paciente Asmático* (PAPA, Asthma Patient Support Program) of the Federal University of Maranhão University Hospital—a Brazilian Unified Health Care System hospital located in the city of Maranhão, Brazil—the faculty, student body, and administration interact. At this same university hospital, there are two programs aimed at determining the levels of antibodies in children and adults by detecting total IgE and specific IgE to filamentous fungi of the region. Adult patients have participated in the PAPA for more than ten years, and children are periodically treated at the Allergy Outpatient Clinic of the Maternal and Infant Unit.

This study was preceded by an inventory of the fungi in the outdoor air of this region of the "Legal Amazon", the fungi varying in relation to seasonality, area of residence of the patients studied, age, and gender. The climate of this region is predominantly hot and humid, which promotes the growth of filamentous fungi, composed of hyaline and dematiaceous genera that are typical of indoor and outdoor environments and whose potential role in respiratory allergy remains controversial.

We observed the presence of fungi throughout the year, with a slight increase in the percentage of fungal genera in the months of May, August, and September. There were no significant differences in the mean number of fungal CFUs in relation to the month of the year ($p = 0.7097$). However, there were significant differences among the mean CFUs of the five most prevalent genera—*Aspergillus*, *Penicillium*, *Cladosporium*, *Curvularia*, and *Fusarium*—($p = 0.0002$). The comparison of the residential areas of the northern, southern, central, eastern, and western regions of the city of São Luís in terms of the number of CFUs of the fungi recovered per study area revealed a significant relationship ($p < 0.0001$). When we related these fungi to type of season (rainy or dry), temperature, relative humidity, rainfall, wind speed, and atmospheric pressure, we found that the *Aspergillus* genus was present in all areas during all months, except for the month of September in the northern area.

These results raise a question about these filamentous genera, with special attention also to the dematiaceous fungi found in this study, including the *Cladosporium* and *Curvularia* genera mentioned among the five most prevalent, in addition to others, such as *Drechslera*, *Nigrospora*, *Alternaria*, and *Exserohilum*, which commonly proliferate at high temperatures.

The levels of total IgE and specific IgE to fungi detected in the analysis of the adult patients and children in this study were found to cause sensitization to the probable fungal allergens mentioned. Atopic patients (with asthma or rhinitis) usually have increased levels of IgE antibodies to fungi as a feature of polysensitization.[4] It becomes necessary to characterize allergenic proteins in these fungi, which can produce byproducts that, combined with educational skills and early diagnosis, will consequently result in asthma control.

The study suggests that adherence of adults to the education program has no relation to the immunoglobulin levels detected. Additional studies indicate that an important link between environment and asthma can occur via exposure to environmental proteinases and via airway infections with protease-producing organisms, such as fungi.[3,5] Recent findings regarding molecular cloning of fungal allergens, as well as the availability of genome sequencing of these microorganisms, might facilitate the characterization, cloning, and production of fungal allergens of high purity. Some studies indicate that cross-reactivity is an important component of fungal sensitization.[4,6]

These data can help to further the understanding of the impact that bioaerosols have on respiratory health, as well as of the role that airborne fungi play in the quality of the outdoor environment, in the genesis of the clinical profiles of asthma and rhinitis, and in occupational diseases.

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References

1. Oliveira MA. Avaliação de um programa de educação em asma para adultos [thesis]. São Paulo: Universidade Federal de São Paulo; 1999.
2. Johnson L, Ciaccio C, Barnes CS, Kennedy K, Forrest E, Gard LC, et al. Low-cost interventions improve indoor air quality and children's health. Allergy Asthma Proc. 2009;30(4):377-85.
3. Rosário N. Environmental control and prevention of respiratory allergy: evidence and obstacles. J Bras Pneumol. 2009;35(5):495-6.
4. Crameri R, Zeller S, Glaser AG, Vilhelmsson M, Rhyner C. Cross-reactivity among fungal allergens: a clinically relevant phenomenon? Mycoses. 2009;52(2):99-106.
5. Corry DB, Kheradmand F. Toward a comprehensive understanding of allergic lung disease. Trans Am Clin Climatol Assoc. 2009;120:33-48.
6. Bousquet J, Khaltaev N, Cruz AA, Denburg J, Fokkens WJ, Togias A, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA(2)LEN and AllerGen). Allergy. 2008;63 Suppl 86:8-160.