Short Communication

Occupational asthma caused by Ipe (*Tabebuia spp*) dust

E. Algranti[1], E. Medina Coeli Mendonça[1], S. Amed Ali[1], C. M. Kokron[2], V. Raile[1],

From [1]the Division of Medicine, FUNDACENTRO, and [2]Division of Clinical Immunology and Allergy and Laboratory of Clinical Immunology and Allergy, LIM-60, University of São Paulo School of Medicine. São Paulo. Brazil

Dr Vilton Raile was supported in part by the Mount Sinai International Training in Environmental and Occupational Medicine Program funded by the Fogarty International Center (TW000640)

Abstract. *Background:* Ipe is a resistant hardwood that contains naphtoquinones. It is easily found and frequently used in South and Central America. Naphtoquinones are skin sensitizers.
Objective: To describe a case of occupational asthma related to Ipe wood dust.
Methods: The patient was submitted to a clinical evaluation consisting of a respiratory symptom questionnaire, occupational history, serial measurements of lung function by spirometry, skin prick tests, patch tests, specific IgE and specific bronchial provocation tests to Ipe dust.
Results: Serial lung function measurements showed sustained regression of obstruction following removal from exposure. Skin prick tests, but not patch tests, were positive to Ipe, and a specific bronchial challenge showed a late asthmatic reaction. Specific IgE search was negative.
Conclusions: Exposure to Ipe wood dust can lead to occupational asthma. The underlying mechanism should be investigated.

Key words: occupational asthma, wood dusts, Ipe wood, *Tabebuia spp*, specific bronchial provocation tests

Introduction

Allergic reactions related to exposure to wood dusts are common. The skin is the most affected organ, followed by the respiratory system. A full spectrum of respiratory diseases associated with occupational and environmental exposures to wood dusts has been previously described [1,2]. Wood dusts contain lignin and cellulose but allergic/inflammatory reactions are probably elicited by chemical constituents of the dust, parasitic fungii and by other chemicals of common use in the wood/furniture industry, as wood preservatives, varnishes and paints.

Until 1996, occupational asthma (OA) due to exposure to wood dusts have been described for 22 different botanic species and 3 other non-classified woods [3]. A recent Medline search disclosed 3 further reports of wood species causing OA [4-6]. Epidemiological evidences also suggest that pine wood dust exposure is associated with an increased risk of asthma [7] and bronchial hyperresponsiveness [8,9].

Ipe, the common name for the lapacho group of the *Tabebuia* genus, consists of about 20 species of trees and is found in Central and South America [10]. They all contain naphtoquinones. In Brazil, the main species are *Tabebuia ochraceae, Tabebuia impetiginosa*, *Tabebuia longifolia* and *Tabebuia serratifolia*. All are known in international trade as Ipe. They are commonly used in construction works for external structures, stairs and parquets. We are describing the case of a wood worker who developed asthma after exposure to Ipe dust.

Case Report

A 52-year old male was referred to our outpatient clinic in September 2000. He was a wood sawyer and trimmer since 1994. In March 2000 he developed symptoms of hoarseness and shortness of breath. Shortly afterwards, he noted wheezing with shortness of breath during afternoons and evenings, of increasing severity needing treatment in emergency rooms with inhaled medications. He felt better on weekends. Four months after the symptoms began he was put on sick benefit, away from the industry. He rapidly improved, needing sporadic inhaled bronchodilators. In August 2000 he was submitted to a direct laringoscopy that showed supraglotic redness and a vocal cord nodule. He had neither a previous history of respiratory diseases nor atopic symptoms. A former smoker of 18 pack-year, he stopped in 1997.

The symptoms began a few months after he started to saw and trim Ipe wood. Formerly he used to work with pine wood only.

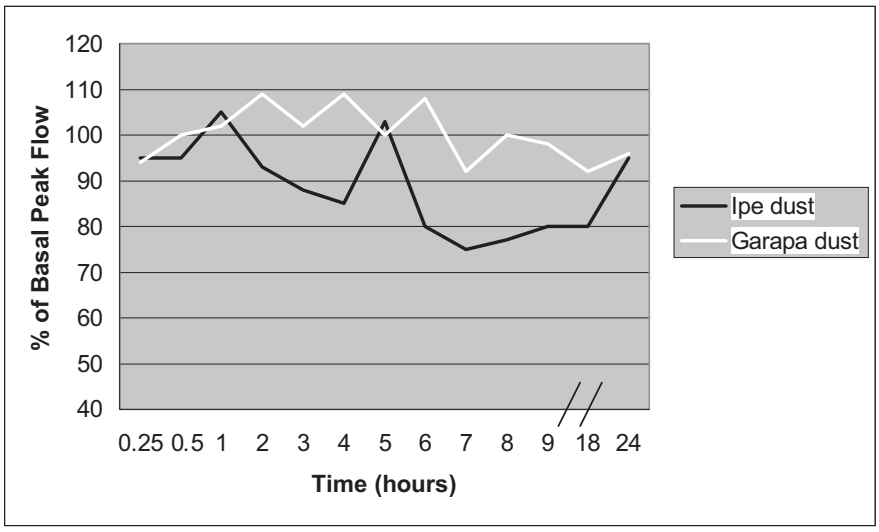

Figure 1. Bronchial challenge test with Ipe and Garapa dust (control)

Methods and Results

Results of lung function are shown in Table 1 (Pulmonaire, Jones, Oakbrook, IL, USA).

Occupational-type specific inhalation provocation tests [11] with Ipe dust (45 days after removal from exposure) and Garapa (*Apuleia leiocarpa)* dust were performed one month apart. Garapa is a hardwood from the Leguminosae family that does not contain naphtoquinones [10]. The patient handled freshly sawed dusts in a closed room for 20', tipping dust with two recipients, and disclosed a late asthmatic reaction to Ipe dust only. Results are shown in Figure 1.

Skin prick tests were performed with a set of 7 common inhaled allergens plus negative and histamine controls (Alk Abelló, Madrid, Spain) with negative findings. Skin prick tests with weight per volume saline dilutions of freshly sawed Ipe dust revealed wheals of 5mm, similar to histamine, after 60 minutes for 1, 3 and 5% dilutions. Skin patch tests with both saline and alcoholic dilutions were negative after 48 and 96 hours.

For *in vitro* specific IgE measurements, an extract from *Tabebuia* spp dust was prepared in phospate buffered 0.1 molar saline dyalised against destilled water and lyophilized. A 2mg/ml protein solution was coupled to activated ImmunoCAPÆ at 10,100 and 1,000ul volumes according to standard procedures. Serum from the patient and a control spiked with IgE to 10,000 kU/L were tested and proved negative.

Discussion

Ipe is a hardwood found in Central and South America, resistant to fungi and other biological agressions. It is suitable for flooring (parquets), stairs, external areas, and sports goods and also for maritime constructions. *Tabebuia* spp belongs to the Bignoniaceae family. They contain naphtoquinones, namely lapachol,

Table 1. Serial spirometries after removal from exposure.

Days away from exposure	**15***	**45**	**70**
FVC (1)	2.80	3.40	3.44
FEV_1 (1)	1.84	2.57	2.64
FEV_1/FVC (%)	66	76	76

* Positive response to bronchodilator.

deoxylapachol and lapachenole, all capable of render guinea pigs skin sensitized [12]. Descriptions of human deaths and worm elimination from swallowing Ipe dusts are found in the past (Freise FW, 1936, cited in the Botanical Dermatology Database) [10]. Naphtoquinones also present a strong activity against trypomastigote forms of *Trypanossoma cruzi*, the agent of Chagas disease [13].

The reported case *is* an example of OA. The clinical and occupational history are plausible, there was a clear time relation with the introduction of Ipe wood in the sawmill, symptom regression when away from exposure, functional diagnosis of asthma and an objective measure of lung function decline after specific challenge. Skin prick tests to common inhaled antigens were negative but weight per volume dilutions of freshly sawed Ipe dusts elicited positive wheals after 1 hour. Although delayed prick test reactions may be associated with Type IV hypersensitivity [14] skin patch tests were negative in the present case. Search for specific IgE in the patient's serum was negative. A recent case report and revision of asthma cases from wood dusts showed that in 5/12 cases specific IgE tests were negative [15]. It should be reminded that blood was collected after 2 years of exposure removal.

This is the first report of OA caused by exposure to Ipe wood dusts. As it is a widely used timber in South and Central America, more studies are needed to identify the precise mechanism of this asthma.

Acknowledgements

The authors wish to thank Dr. Geraldo José Zenid from the Division of Forestry Products, Instituto de Pesquisas Tecnológicas (IPT-SP) for the botanical wood identification through the analysis of its anatomical characteristics. The authors also thank Drs. Elaine Briguenti Ferraz and Lena Ahlborg from Pharmacia for developing the specific IgE tests.

References

1. Goldsmith DF, Shy CM. Respiratory health effects from occupational exposure to wood dusts. Scan J Work Environ Health 1988;14:1-15.
2. Enarson DA, Chan-Yeung M. Caracterization of health effects of wood dust exposures. Am J Ind Med 1990;17:33-38.
3. Chan-Yeung M, Malo JL. Occupational respiratory diseases associated with forest products industries.In: Harber P, Schenker M, Balmes J. eds. Occupational and experimental respiratory disease. St. Louis, Mosby, 1996:637-653.
4. Higuero NC, Zabala BB, Villamuza YG, Gomez CM, de Gregorio AM, Sanchez CS. Occupational asthma caused by IgE-mediated reactivity to Antiaris wood dust. J Allergy Clin Immunol 2001;107:554-556.
5. Obata H, Dittrick M, Chan H, Chan-Yeung M. Occupational asthma due to exposure to African cherry (Makore) wood dust. Intern Med 2000;39:947-949.
6. Jeebhay MF, Prescott R, Potter PC, Ehrlich RI. Occupational asthma caused by imbuia wood dust. J Allergy Clin Immunol 1996;97:1025-1027.
7. Hessel PA, Herbert AF, Melenka LS, Yoshida K, Michealchuk D. Nakaza M. Lung health in sawmill workers exposed to pine and spruce. Chest 1995;108:642-646.
8. Malmberg PO, Rask-Andersen A, Larsson KA, Stjernberg N, Sudblad BM, Eriksson K. Increased bronchial responsiveness in workers sawing Scots pine. Am J Respir Crit Care Med 1996;153:948-952.
9. Douwes J, McLean D, Slater T, Pearce N. Asthma and other respiratory symptoms in New Zeland pine processing sawmill workers. Am J Ind Med 2001;38:608-615.
10. Botanical Dermatology Database: www.uwcm.ac.uk/uwcm/dm/BoDD/index.html.
11 Pickering CAC, Batten JC, Pepys J. Asthma due to inhaled wood dusts-western red cedar and Iroko. Clin Allergy 1972;2:213-218.
12 Schulz KH, Garbe I, Hausen BM, Simatupang MH. The sensitizing capacity of naturally occurring quinones. Experimental studies in guinea pigs. I-Naphtoquinones and related compounds. Arch Dermatol Res 1977;258:41-52.
13 Pinto CN, Dantas AP, de Moura KC, Emery FS, Polequevitch PF, Pinto MC, de Castro SL, Pinto AV. Chemical reactivity studies with naphtoquinones from Tabebuia with anti-trypanossomal efficacy. Arzneimittelforschung 2000;50:1120-1128.
14 Gottlöber P, Gall H, Peter RU. Allergic contact dermatitis from natural latex. Am J Contact Dermatitis 2000;12:135-138.
15 Pontier JP, Popin E, Kopferschitt-Kubler MC, Bessot JC, Pauli G. L'asthme au bois d'abachi. Rev Pneumol Clin 2002;58:282-285.

Dr. Eduardo Algranti

DMe/FUNDACENTRO
Rua Capote Valente 710
05409, São Paulo, SP
Brazil
Phone: + 55 11 30666190
Fax: + 55 11 30666344
E-mail: eduardo@fundacentro.gov.br

