

## Occupational asthma caused by IgE-mediated reactivity to *Antiaris* wood dust

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*To the Editor:*

*Antiaris* is a very large tree that belongs to the family of the Moraceae trees. There are 2 different species, *Antiaris africana* and *Antiaris toxicaria*. The first species is found in Senegal, Nigeria, Sudan, and Uganda, where boats are made with its timber, whereas in Spain this wood is used to manufacture furniture, doors, and so forth. The second species is known as *upas* and comes from Asia. Its sap is poisonous if it comes into contact with the blood.<sup>1</sup>

We report a case of asthma caused by *Antiaris* in a woodworker. To the best of our knowledge, this is the first reported case of allergy to *Antiaris* wood.

### CASE REPORT

A 28-year-old man had worked manufacturing doors for 7 years. During the last 3 years, he had symptoms of rhinoconjunctivitis and asthma attacks when working with *Antiaris*, pine, and *Mansonia* wood, particularly the first one, but remained symptom free when not exposed (during holidays, sick days, etc). Significantly, he had an asthma attack when he collected *Antiaris* sawdust for analysis.

Physical examination, blood test, and basal spirometry results were normal.

### RESULTS

We prepared dialyzed 10% (wt/vol) *Antiaris*, pine, and *Mansonia* wood extracts and carried out several in vivo and in vitro tests.

#### *In vivo tests*

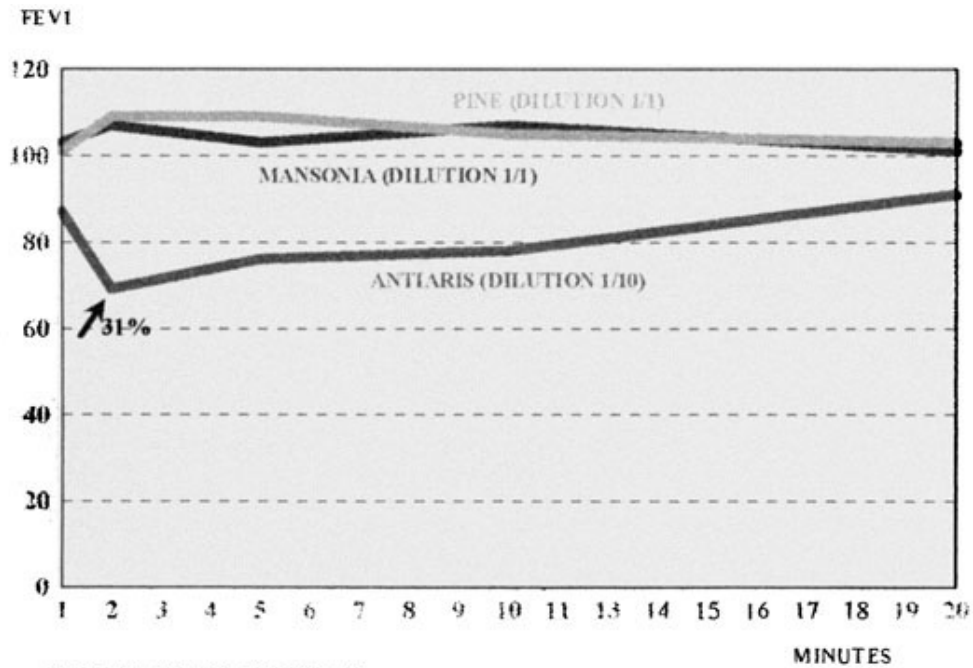
Skin prick and intradermal tests were performed with the wood extracts obtained, according to the Subcommittee on Skin Tests of the European Academy of Allergology and Clinical Immunology.<sup>2</sup> The prick test was positive only for *Antiaris*, whereas *Mansonia* and pine extracts gave a positive intradermal response at a dilution of 10<sup>-2</sup>. A broad sample of common and well-known inhalant prick tests was also used, and all of them yielded negative results. Skin test (prick and intradermal) results were negative in the control group (7 exposed and 5 nonexposed workers) for all 3 extracts.

A conjunctival provocation test was performed only with *Antiaris*. It consisted of the administration of 1 drop of extract in the conjunctival sac. If no reaction appeared within 20 minutes, a higher concentration of extract was placed into the same eye. A negative control test was carried out by administration of 1 drop of diluent into the conjunctival sac of the other eye. A positive result (itching, congestion of the conjunctival mucosa, and watering of the eye) was obtained with a 1:100 dilution of *Antiaris* extract.

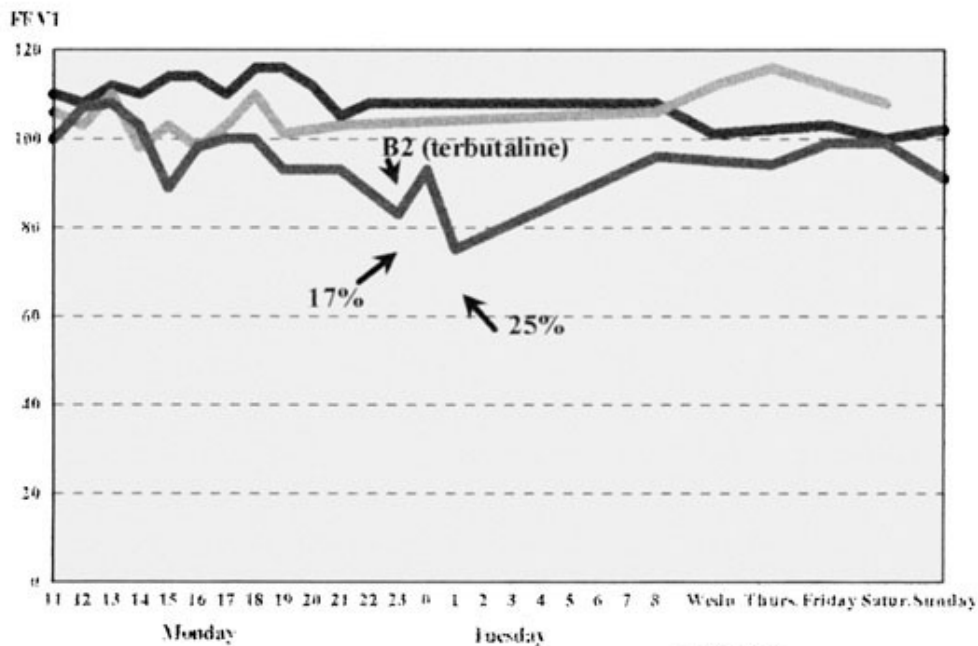
A nonspecific bronchial provocation test was performed according to the method described by Cockcroft et al<sup>3</sup> using methacholine, and the PC<sub>20</sub> (provocative concentration of agonist producing a 20% fall in FEV<sub>1</sub>) value was 0.4 mg/mL; the pH of the solution was 7.5.

Specific bronchial challenge was performed with all 3 kinds of wood (pine, *Mansonia*, and *Antiaris*), but only *Antiaris* gave a positive response. We modified the method of Cockcroft et al<sup>3</sup>: the aerosol was generated by a De Vilbiss 646 nebulizer. Our patient inhaled it for 2 minutes during tidal breathing. We measured the FEV<sub>1</sub> before the test and after 30 and 90 seconds and then at 5-minute intervals for 30 minutes. Ninety seconds after challenge with a 1:10 dilution of *Antiaris* extract, FEV<sub>1</sub> decreased 31%; this was treated with inhaled terbutaline. After this challenge, our patient was checked by spirometry every hour during the first 24 hours and then once a day for a week. We observed a decrease in FEV<sub>1</sub> of 17%, associated with cough and dyspnea, 12 hours after the test. It was controlled with terbutaline. Two hours later the FEV<sub>1</sub> fell 25% without any symptoms and resolved without treatment (Fig 1).

**Fig. 1.** Specific bronchial challenge (immediate [A] and late [B] response).



**A** SPIROMETRY CONTROL



**B** SPIROMETRY CONTROL

ANTIARIS  
MANSONIA  
PINE

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We performed a specific challenge test with *Antiaris* in a control patient with the same  $PC_{20}$  as our patient, and the result was negative. Specific challenge tests with *Mansonias* and pine were carried out with the same technique, and both yielded negative results.

We did not check the peak flow because during the study the patient became ill with a biliary problem, and when he returned to work, we already knew the result of the specific bronchial challenge, so we did not consider this test to be necessary.

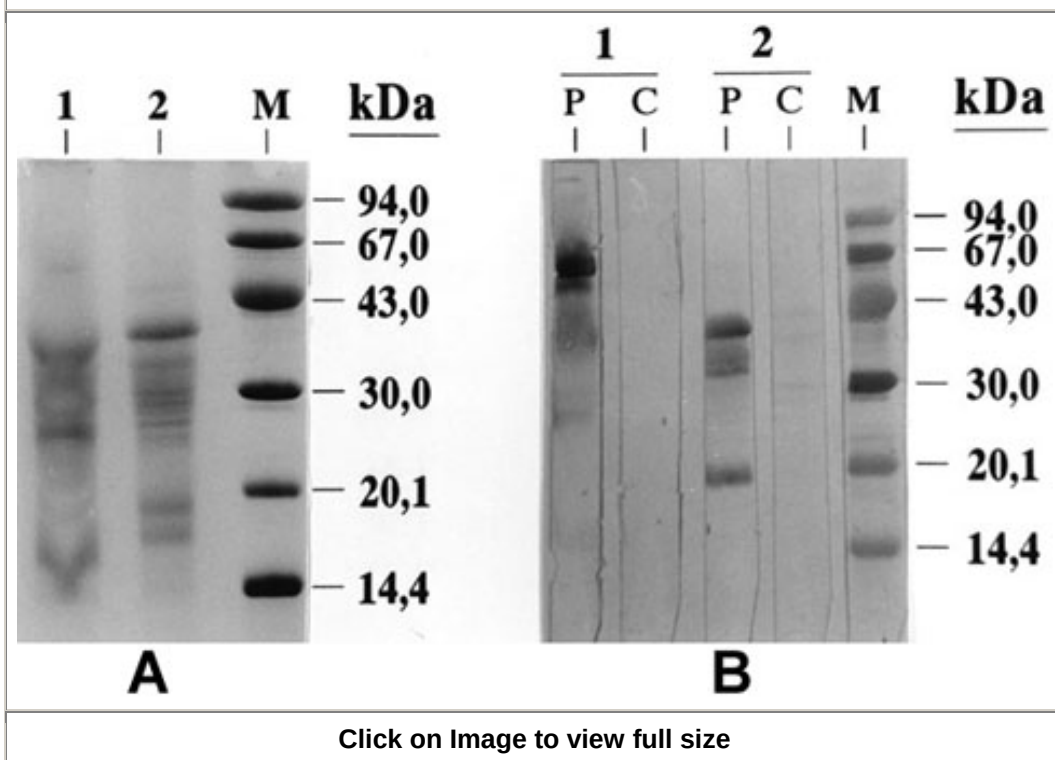
### *In vitro* test

The level of total IgE was 203 IU/mL (CAP System Pharmacia). Specific IgE levels against pine, *Mansonia*, and *Antiaris* were measured by ELISA (Sanofi Pasteur Diagnostics); the results were 7.25 PRU/mL (class 3) for *Antiaris* and negative for the other 2 types of wood. The protein content of the wood extracts amounted to 20% (wt/wt).

Results of the double diffusion test, or Ouchterlony test, were negative for every extract.

The molecular masses of the *Antiaris* extract proteins were studied with the SDS-PAGE, and their values were distributed between about 47 and 13.8 kd. SDS-PAGE immunoblotting of the extract was carried out in the presence and absence of  $\beta$ -mercaptoethanol (reducing agent), showing different profiles. In the absence of  $\beta$ -mercaptoethanol, 4 bands of the following molecular masses appeared: 3.5, 52, 26, and 15 kd. When it was present, protein molecular masses were 38.5, 33.7, 32, and 19 kd (Fig 2).

**Fig. 2.** SDS-PAGE (A) immunoblotting (B). 1, In the absence of  $\beta$ -mercaptoethanol; 2, in the presence of  $\beta$ -mercaptoethanol.



### DISCUSSION

Wood dust causes different respiratory diseases, one of which is asthma. There are several forms of asthma caused by different kinds of dust, but the pathogenic mechanism has only been determined for some of them. There is no clear knowledge of the characteristics of the substance in wood that is the cause of this illness. Only in some cases, such as allergy to red cedar, has it been identified.<sup>4</sup>

This is a case of occupational asthma caused by type I hypersensitivity to *Antiaris* wood. We have been able to prove that there is an IgE specific to *Antiaris* proteins in the serum of the patient. Bronchial challenge with this wood extract yielded positive results with a

dual response. The proteins recognized by a specific patient serum IgE change their mobility because of the presence of  $\beta$ -mercaptoethanol (a reducing agent). This fact suggests the existence of disulfide bridges in the quaternary or tertiary structure of these proteins. Further investigation is required to identify the allergens in wood.

Some studies in the literature describe occupational asthma cases that are similar to ours, in connection with specific types of wood such as ramin, obeche,<sup>5</sup> and ash,<sup>6</sup> among others. An interesting finding in all of these cases is that there is a specific positive IgE, and bands of protein specifically recognized by the patient are identified, confirming that wood is a major source of antigens in occupational asthma.

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